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ALTERNATIVE METHODS OF ESTIMATING BENEFITS: AN ECONOMIC EVALUATION OF BIG GAME HUNTING IN ALBERTA

by

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The undersigned certify that they have read and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Alternative Methods of Estimating Benefits: An Economic Evaluation of Big Game Hunting in Alberta" submitted by Robert A. Prather in partial fulfilment of the requirements for the degree of Master of Science.

ABSTRACT

In the literature there are a number of alternative methods presented for use in the evaluation of recreational activities. The methods vary as do the activities to which they are applied. This thesis is an enquiry into the applicability of three selected types of recreation evaluation methods to an Alberta recreational activity, big game hunting.

The selected methods were the Pearse, Direct, and Hotelling-Clawson methods. The Pearse method utilizes income level as a proxy for a price to which big game hunters will adjust their volume of participation. The Hotelling-Clawson method utilizes distance as a proxy for price, while the Direct method relies on individual statements of willingness or unwillingness to pay. The critical factor in evaluating these methods is the basis for computing the respective extramarket or consumer surplus components.

Resource managers and public decision-makers in Alberta need to be made aware of the alternative evaluation methods available to them, their limitations, and their usefulness under varying circumstances. With Alberta's vast and varied resource base, the allocation of resources to alternative uses is complicated by the existence of tendencies towards complementarity, substitutability, and competition in resource use. Alberta big game hunting is one recreational activity that has recently come up against problems in terms of allocation and evaluation. The situation with respect to big game hunting is further complicated by the possibility of benefits and costs differing in

absolute terms for the hunters themselves, the Province of Alberta, and society in general.

The results of the estimates and analysis point out some important theoretical and procedural implications with regards to the selected methods. There was no clear-cut advantage in the application of one of the methods over another, although the Direct method did have some advantage in the procedural aspects (computational ease). In dollar terms, the degree of conservatism in estimates ranged from low for the Pearse method to high for the Hotelling-Clawson method. The Direct method estimates were intermediate. The variations in the magnitude of the estimates were directly attributable to the extramarket benefits or consumer surplus estimates for Alberta big game hunting. The lack of interpersonal comparisons in the Direct Method provided a basis for differentiating between its estimated net benefits and those derived using the two indirect methods. These alternative methods (Hotelling-Clawson and Pearse) are dependent upon their homogeneity assumptions. The population zone homogeneity assumption was considered to have led to relatively conservative net benefit estimates for the Hotelling-Clawson method, while the income zone homogeneity assumptions led to relatively higher estimates for the Pearse method.

The regional breakdown of data in this thesis provides a useful basis for drawing policy implications regarding big game hunting in different areas of the Province. Analysis of this breakdown has implications for differential pricing (hunting fees) and control (hunter intensity).

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CHAPTER I

INTRODUCTION

Problems and Objectives

In recent years, the implications and impacts of natural resource management in an era of rapid economic growth have become increasingly complex. Resources allocated for the provision of recreation activities are of particular significance in light of a general trend towards increased leisure time, increased mobility, higher incomes, improved technology, and urbanization. This trend has brought emphasis to the developing conflicts in resource allocation for alternative uses. Greater pressures on recreation resources are inevitable with increased participation induced by greater affluence, technological change, and urbanization.

Among the wide range of recreation activities available, those referred to as outdoor recreation activities are of particular concern to public resource managers. Participation in these activities reflects the aesthetic nature of the experience and the cash costs of these activities do not necessarily reflect the value of the activity. The evaluation of alternative uses for the resources involved can aid resource managers in establishing priorities for decisions involving the allocation or reallocation of these resources.

Big game hunting is an outdoor recreation activity utilizing natural resources which may be competitive or complementary

with alternative resource uses. In North America, big game hunting is regarded as a public good by tradition. Therefore, the various governments involved bear the responsibility for the management of this resource package. They must examine all public and private alternative uses that are feasible for the various resources under consideration. Institutional arrangements have resulted in big game hunting not being valued in a market. The activity is permitted at an arbitrarily determined price in the form of licence fees.

The interrelated nature of big game hunting is restrictive in relation to the decision-making associated with this activity. The decision-maker must rationalize his allocation decisions on the basis that this resource-based activity is looked upon as a public good but where, in fact, it is divisible in consumption, and not marketed for institutional reasons. In Alberta, big game hunting is provided at a nominal cost which does not adequately reflect the value of the activity. Thus, difficulties are bound to arise in resolving questions of priority in relation to private interests because the value to Albertans of big game hunting activity in Alberta cannot be readily identified. There is definitely a need for evaluation of this activity in light of developing conflicts, particularly in the oil, gas, coal, timber and agricultural sectors of the Alberta economy.

With this in mind, the objectives of this study are as follows:

1. To evaluate the social net benefits accruing to individual big game hunters, the Province of Alberta, and society in general from Alberta big game hunting

in 1969.

2. To compare and evaluate three selected methods of evaluating the extramarket benefit component of outdoor recreation activities, the methods chosen being:

    a) Hotelling-Clawson (uses distance as a proxy for price),

    b) Pearse (uses income as a proxy for price), and

    c) Direct (enquiries directed at the participant regarding his willingness to pay).

3. To examine policy implications which result from using the selected methods to evaluate big game hunting in Alberta.

This study involved the evaluation and quantification of benefits and costs accruing from Alberta big game hunting. A comparative evaluation of the three selected methods would appear to be of significance to Alberta resource management and associated benefit estimation problems.

Geography, Climate, And Wildlife Resources Of Alberta[1]

Alberta has perhaps the most varied landscape of all the Canadian provinces, which gives rise to its diversity of resources and resource-based industries. The more prominent of these industries are those associated with oil, gas, coal, timber and agriculture. The land mass of Alberta is approximately 248,800 square miles and is supplemented with about 6,485 square miles of fresh water.

Moving westward from the Alberta-Saskatchewan border there is a progression in altitude to a maximum of about 10,000 feet in the Alberta portion of the Rocky Mountain Range. The prairie and parkland regions slowly give rise to foothills at about 4,000 feet and the foothills develop into mountains. The mountainous regions of Alberta contain Banff, Jasper, and Waterton National Parks. The remaining national parks in Alberta, namely Elk Island and Wood Buffalo, are in the central and northern regions, respectively, as are the majority of provincial parks.

Alberta's climate is mainly continental and subject to weather extremes. The mean monthly temperature is about 50°F. from May to

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[1]Information on Alberta's geography and climate was taken from Alberta Bureau of Statistics, Alberta Industry and Resources, 1968 (Edmonton: Queen's Printer, 1968), and the information on wildlife resources was adapted from R. J. Miller, Alberta's Hunting and Fishing Resources: An Economic Evaluation (Edmonton: Economics Division, Resource Economics Branch, Alberta Department of Agriculture, 1971).

September in most areas. Alberta has the most hours of bright sunshine in Canada, calculated at 2,000-2,200 hours annually. Average annual precipitation has been known to vary between 11 and 28 inches over the province. Southeast Alberta is the only section dominated by a lack of precipitation. Complex wind patterns and low relative humidity are prevalent over most of the province.

The diverse nature of the geography and climate of Alberta has provided this region with suitable habitat for many species of wildlife.[1] Alberta consists of three relatively well-defined geographic-economic regions. The southern region, extending roughly a distance of about 200 miles north of the Canada-U.S. border, is generally dry, treeless, gently rolling prairie. It is considered a dry farming area where brown and dark brown soils are indigenous and grains have been partially substituted for natural grasses. Drainage is provided by the St. Mary's, Bow, South Saskatchewan, and Red Deer rivers. The area is well-suited for irrigation because of a good drainage system, a capacity for relatively low cost storage reservoirs, and a substantial summer water supply from mountain snows and glaciers. Game in this area is primarily bird game, with blue grouse, spruce grouse, ruffled grouse, sharp-tailed grouse, sage grouse, hungarian partridge, ring-necked pheasant, mallard duck, etc. being found in various portions of this region. Big game in this area consists mainly of antelope and deer with some elk, moose, bear,

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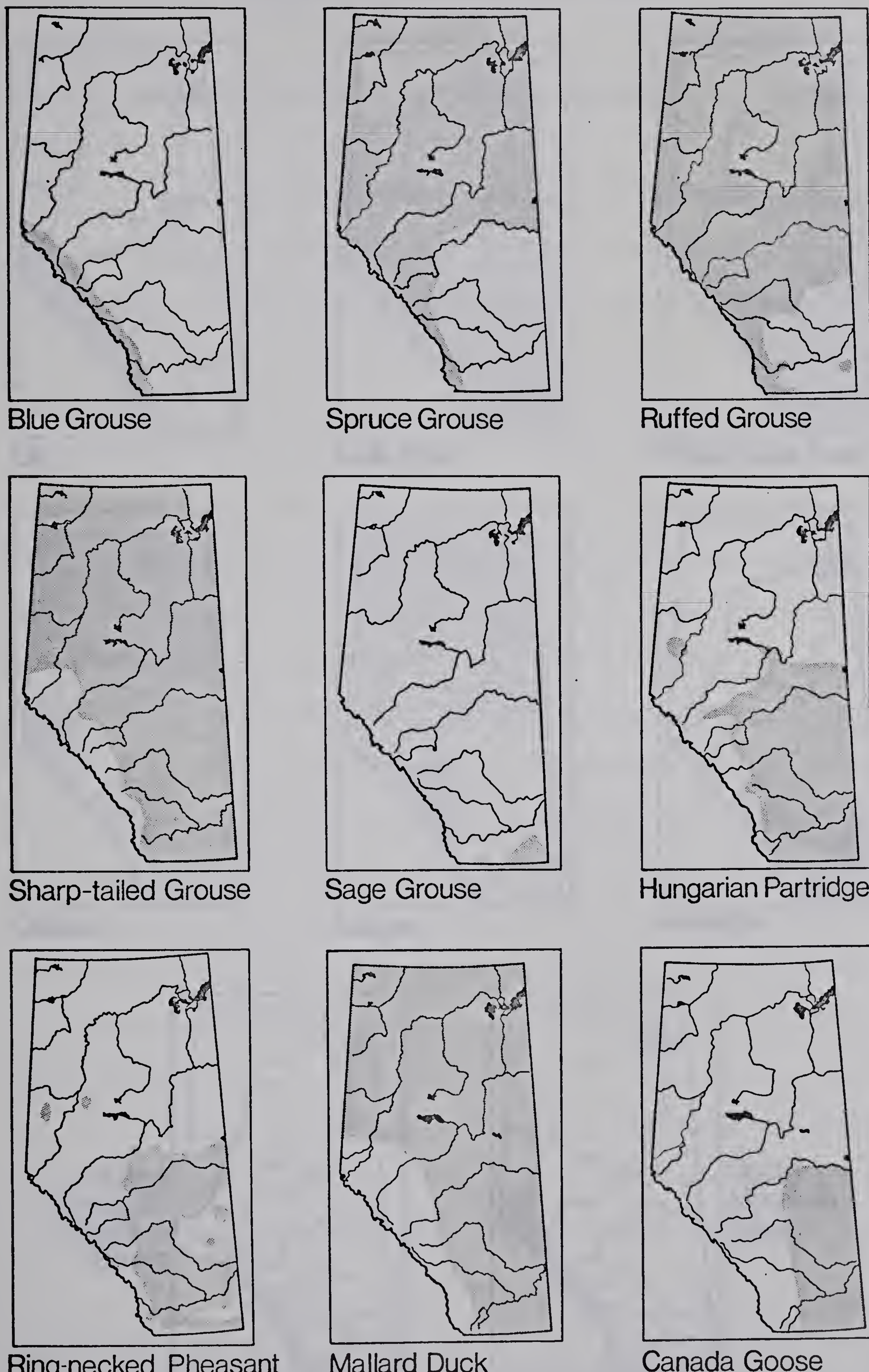
[1]See Figures 1 and 2, pp. 6 and 7.

Figure 1

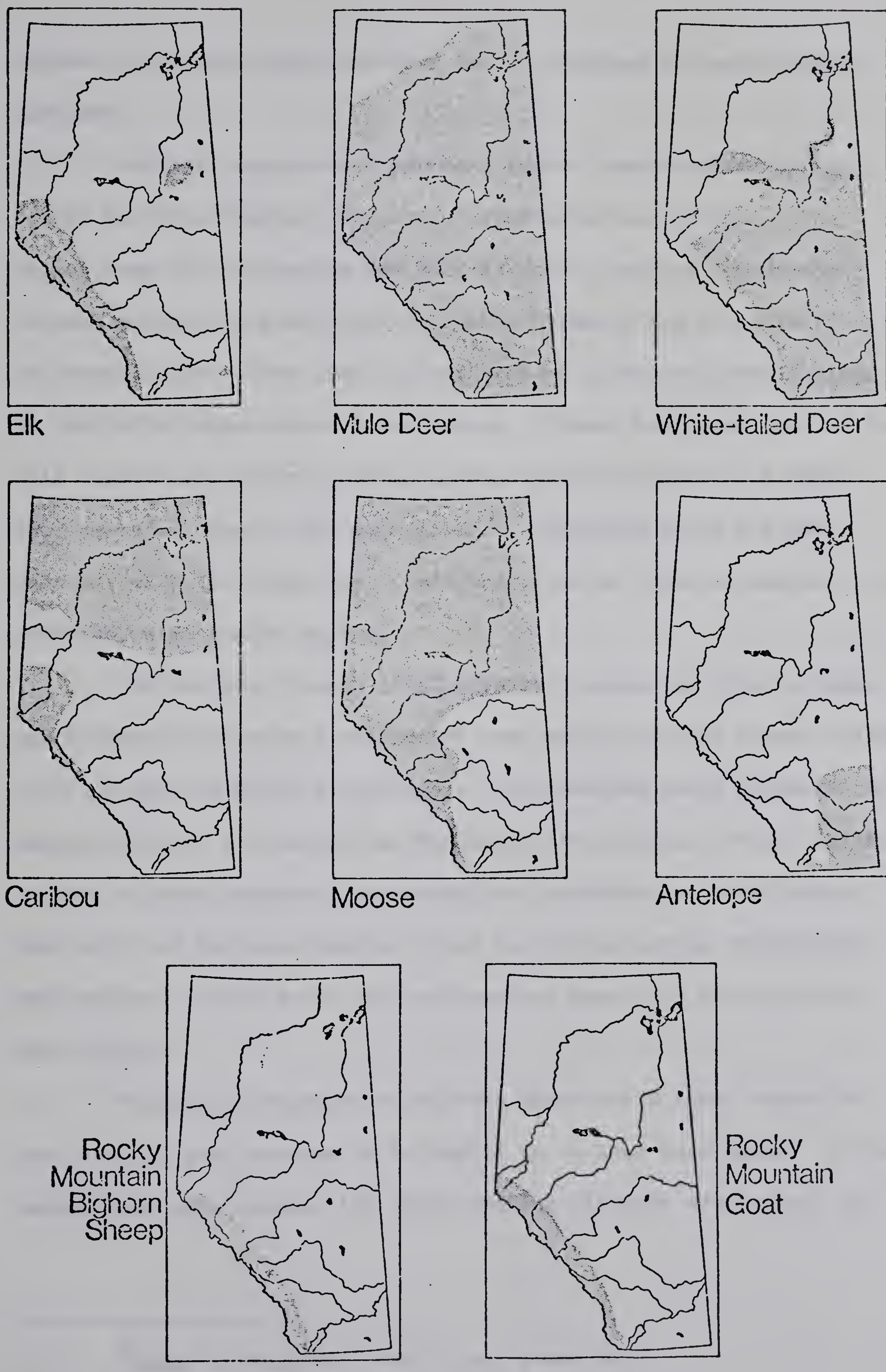
HABITAT OF COMMON BIRD GAME SPECIES



Source: R. J. Miller,"An Economic Evaluation of Alberta's Sport Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971), p. 8.

Figure 2

HABITAT OF COMMON BIG GAME SPECIES



Source: R. J. Miller, "An Economic Evaluation of Alberta's Sport Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971), p. 9.

bighorn sheep, and Rocky Mountain goats occupying the mountainous portions.

Central Alberta is a parkland region characterized by wide ridges and broad valleys interlaced with lakes and streams. The region runs north from the Red Deer-Stettler line and encompasses an area adapted to grain growing, mixed farming, and a diversity of forest types. This area is dominated by black soils and drained by the North Saskatchewan River system. Common bird game species in this region are basically those common to the province as a whole with the exception of the sage grouse. Virtually every big game species, with the exception of antelope, can be found in various locations within this region.

The northern region of Alberta is a region of rivers, lakes and forests containing a section of open prairie in the Grande Prairie district and the Peace River Valley. Grey-wooded soils dominate the region which is drained by the Mackenzie River system. Mixed farming, lumber, oilseed cropping, and mining are important to this region. Most bird and big game species found in Alberta can be located here. Sage grouse, Canada geese and antelope are generally not found in this region.

Within the Province of Alberta there are a large number of bird and big game species to be hunted in various locations.[1] Of the various big game animals for which hunting licences are issued, the

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[1]Refer to Figures 1 and 2, pp. 6 and 7.

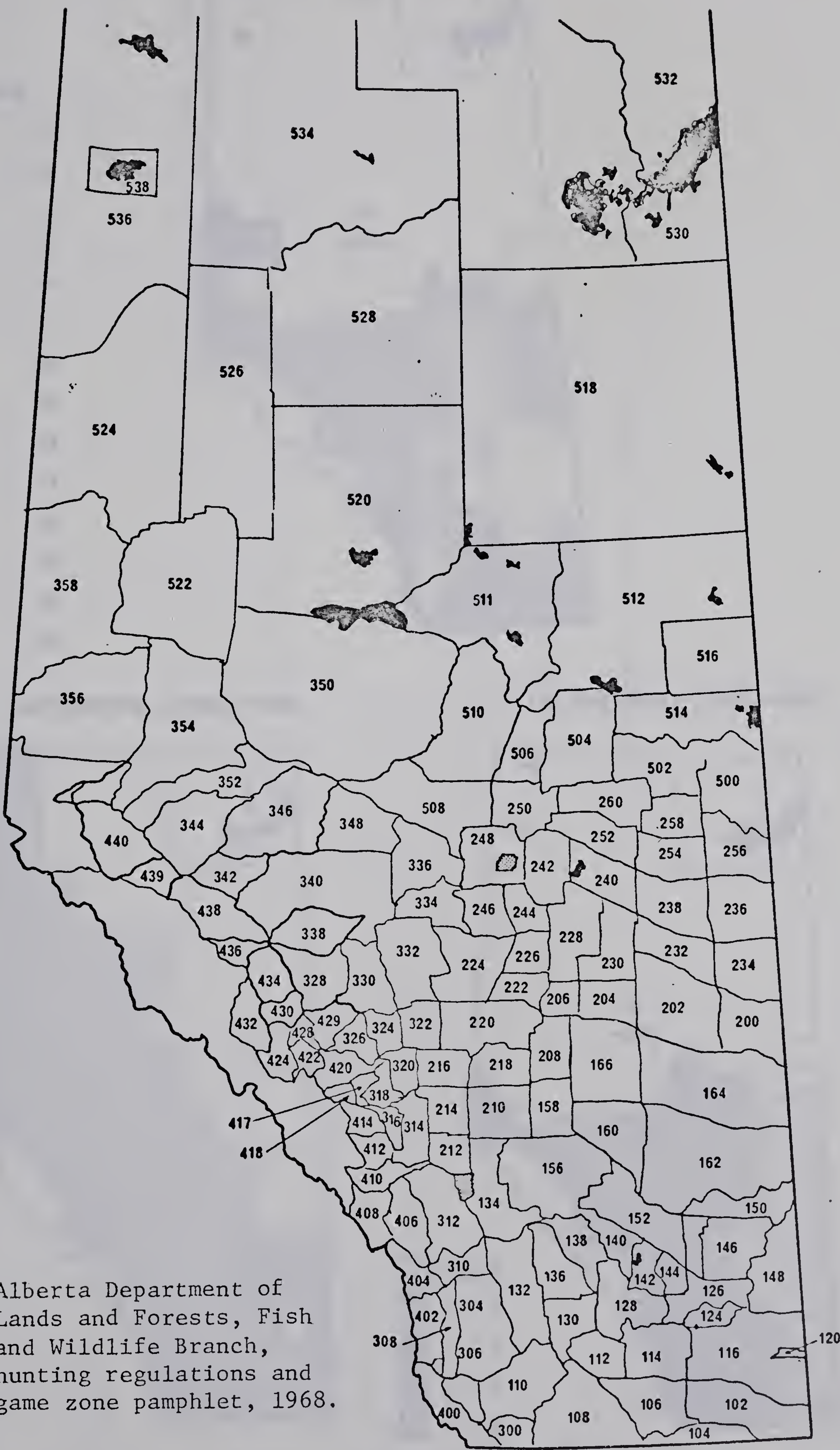
largest portion consists of the cloven-hoofed types (wapiti (elk), mule deer, white-tailed deer, moose, caribou, pronghorn antelope, Rocky Mountain bighorn sheep, and the Rocky Mountain goat species which are classified as browzers and grazers). The remaining licenced species are the grizzly bear and black and brown bears which are fur-bearing big game animals. Other fur bearers such as wolf, cougar, and lynx are protected by different regulations apart from licence sales for hunting purposes.

Game management in Alberta is under the auspices of the Department of Lands and Forests, Fish and Wildlife Division. Management has allocated the control of hunting in designated subzones, referred to as wildlife management units (Figure 3). These management units have been further grouped in alternate patterns according to type of game--big game, upland bird, and waterfowl (Figure 4).

In examining the wildlife resources of Alberta, it is evident that these resources could be more valuable contributors to the Alberta economy. The future of the various game species is uncertain, partially through a lack of confidence in evaluations pertaining to these resources. Hunting is of value to many people, as evidenced by the number of hunters participating over the years (see Table 1), but alternative uses for the resources involved must also be considered.

Figure 3

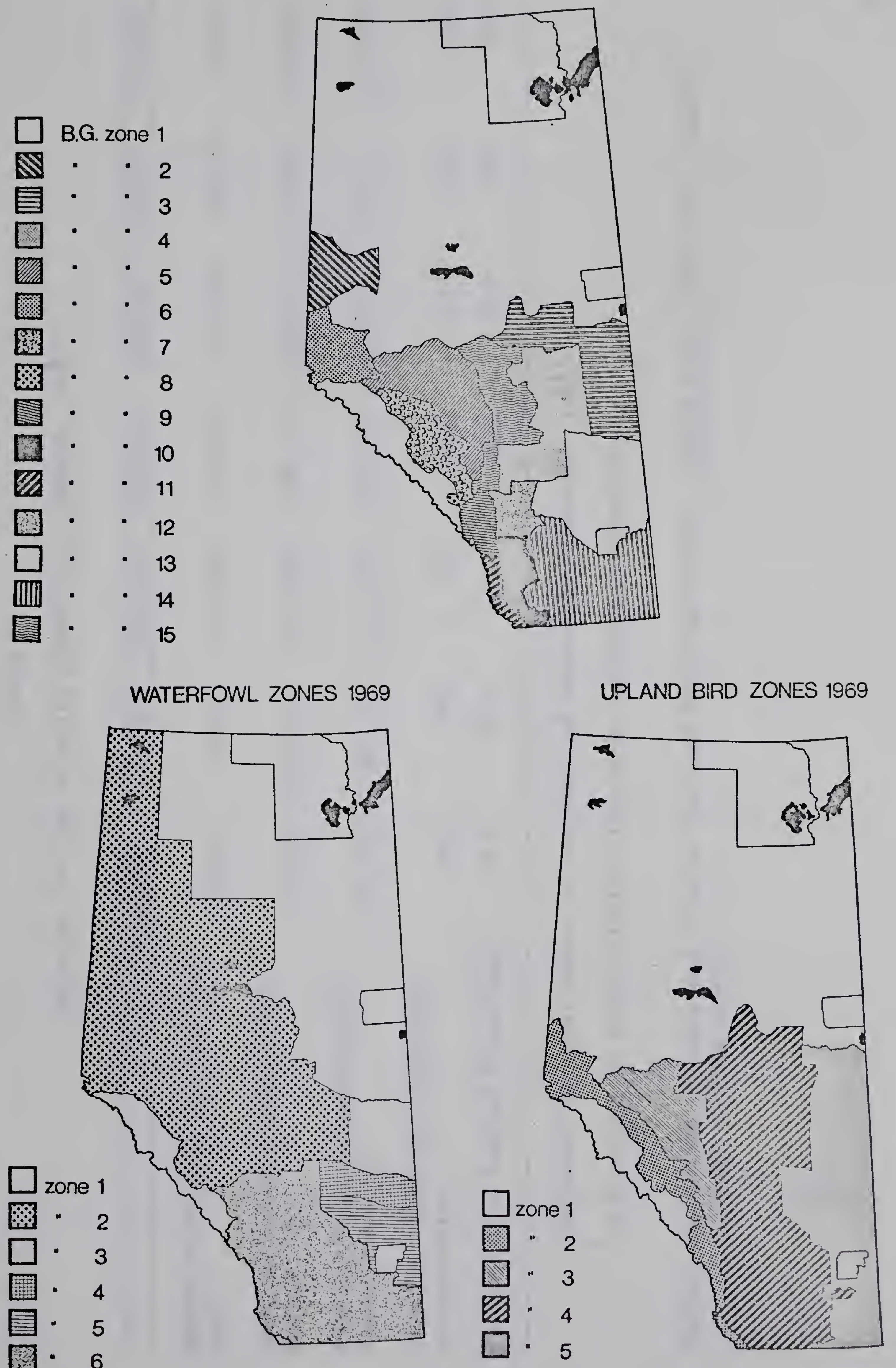
WILDLIFE MANAGEMENT UNITS - ALBERTA



Source: Alberta Department of Lands and Forests, Fish and Wildlife Branch, hunting regulations and game zone pamphlet, 1968.

Figure 4

GAME ZONES OF ALBERTA
BIG GAME ZONES 1969



Source: R. J. Miller, "An Economic Evaluation of Alberta's Sport Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971), p. 10.

Table 1

SELECTED FISH AND WILDLIFE STATISTICS, ALBERTA, 1965-72

	1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72
Number of Wildlife Certificates Sold[1]	109,593	106,132	124,026	119,978	117,408	128,708	132,451
Fish and Wildlife Departmental Revenues ($)	1,035,321	1,091,134	1,416,069	1,707,574	1,680,343	1,857,836	1,946,169
Fish and Wildlife Departmental Expenditures ($)	1,092,325	1,307,432	1,541,023	1,642,779	1,885,497	1,995,177	2,379,480
Wildlife Violations Resulting in Conviction	815	845	833	1,102	1,387	1,517	1,654
Percentage of Hunting Violations[2]	74.4	71.5	77.2	66.3	66.2	58.6	53.0

[1] Indicates the total number of resident and non-resident hunters.

[2] As a percent of total wildlife violations resulting in conviction.

Source: Department of Lands and Forests, Fish and Wildlife Division, Annual Report (Edmonton: Queen's Printer, various years).

Hunting Activity, 1969[1]

The 1969 Alberta hunting season witnessed a continued slackening of hunting activity from previous seasons, only to be followed in the 1970 and 1971 hunting seasons by an increasing trend in wildlife certificate sales (see Table 1). A significant portion of the drop in certificate sales from the 1968 to 1969 season can be accounted for by the closure of the pheasant and Hungarian partridge seasons because of high mercury levels in their tissues, and the closure of the antelope and mountain goat seasons due to a scarcity of animals.[2]

Miller[3] estimated approximately 836,000 days of hunting[4] during the 1969 season. Of this total, bird game hunting was found to account for about 44 percent and big game, 56 percent. Hunting activity was estimated to be 94 percent resident and 6 percent non-resident. Residents of Alberta averaged 7.1 days of hunting and spent

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[1] The 1969 hunting season is considered as that defined by the Alberta Department of Lands and Forests and is referred to in Table 1 as the 1969-70 hunting season.

[2] Alberta Department of Lands and Forests, Annual Report (Edmonton: Queen's Printer, 1970), pp. 90-93.

[3] See Miller, *op. cit.*

[4] A day of hunting or hunter day is defined as a whole or any part of a day spent in game hunting activity.

an average of about $9.77 per day. Non-residents hunted an average of 6.9 days with per day expenditures averaging about $51.43. In total, their combined expenditure on Alberta hunting in 1969 was approximately $10.3 million. The impact of such expenditure is important to both Albertans and the Alberta government which is responsible for these resources and their management.

CHAPTER II

CONCEPTUAL FRAMEWORK

Resource Allocation, Conservation And Public Policy

The allocation of natural resources among alternative uses should be of major concern to public decision-makers in their attempts to maximize social net benefits. This study concerns the evaluation of Alberta big game hunting, utilizing several alternative methods of estimating the extramarket benefits of this resource.[1] Big game hunting is traditionally acknowledged as a public good, but in reality is not a pure public good[2] in that there is a distinct possibility of exclusion through pricing policies. In considering this resource, the public decision-maker should take this into account because:

> in contrast to private goods, where each individual has to pay the cost of production of what he consumes, the cost of a public good can be shared among the individuals enjoying it, and the problem of optimization is to achieve the scale of production of the public good, on a shared cost basis that maximizes social welfare (in the Pareto-optimal sense).[3]

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[1] See S. V. Ciriacy-Wantrup, Resource Conservation: Economics and Policies (3rd. ed.; Berkeley: University of California Agricultural Experiment Station, 1968), p. 85 for a short discussion of the extra-market benefit concept.

[2] Harry G. Johnson defines a pure public good as " . . . one for which enjoyment by one individual does not in any degree exclude enjoyment by the other." Harry G. Johnson, The Two Sector Model of General Equilibrium, the Yrjo Jahnsson Lectures (London: George Allen & Unwin Ltd., 1971), p. 110.

[3] Ibid., pp. 110-111.

Thus, the decision-maker must consider both the pecuniary and non-pecuniary value of the resource in order to achieve a more efficient allocation of big game hunting as a collective good.

Big game hunting can be classified as a flow resource[1] because by nature it is renewable. The game becomes available over successive time intervals and the future flows may or may not be affected by present human intervention. In most cases, big game species are extremely sensitive to human actions. They are a fugitive resource[2] dependent upon natural habitat and characterized by a critical zone.[3] These species can decrease in numbers to a point beyond which the resource flow is economically and in some cases, biologically, irreversible. Big game hunting activity is to an extent responsible for the vulnerability of the various big game species to human action and the decisions of governments, as are such activities as timber cutting and highway construction.

Excessive use of big game hunting opportunities and/or big game habitat can lead to economically irreversible resource depletion. In this context, the definition of resource utilization adopted for this study is that presented by S. V. Ciriacy-Wantrup:

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[1] Ciriacy-Wantrup, op. cit., pp. 38-43 provides a good discussion of flow and stock resources.

[2] Ibid., pp. 141-145 for a discussion of this concept.

[3] Ibid., pp. 38-40.

> . . . conservation and its logical corollary but economically opposite, depletion, are defined in terms of changes in the inter-temporal distribution of physical rates of use. In conservation, the redistribution of use is in the direction of the future; in depletion, in the direction of the present.[1]

Decisions concerning the use of big game resources require the availability of estimates of the optimum utilization rates of the resources. Each individual distribution of use rates is a state of conservation,[2] reflecting the dynamics of resource use. This suggests a need for recognition of a "safe minimum standard"[3] of use as a practical objective for big game managers, since optimum utilization levels are inherent in conservation policy considerations related to big game hunting.

The objective of public decision-makers should be to manage the resource endowment in such a way as to maximize the present and future net benefits of these resources to society. They must do this in a complex situation of interrelated resource use where interdependence of policy decisions is critical. Perhaps the optimization of resource use is directly related to the diversity of resource use and the implication of resource scarcity considerations on policy decisions. Conservation policy, per se, is taken to be "a public

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[1] *Ibid.*, p. 51.

[2] *Ibid.*, p. 53.

[3] See *Ibid.*, pp. 251-258 for a discussion of this concept in its relation to economic and policy questions.

policy which seeks to increase the future useable supplies of a natural resource by present actions."[1] Thus, conservation policy is concerned with the "when" of use. It is important to consider both the pecuniary and aesthetic benefits by taking into account all associated costs and revenues accruing to the planning period and by determining their present values. By doing so, the opportunity costs of alternative uses can be considered in an attempt to maximize social net benefits and to achieve a high level of efficiency in resource allocation relative to conservation theory. In adhering to the principles of game management and economic theory, the maintenance of a viable big game population which maximizes the social net benefits from big game hunting activity may be conducive to overall optimization of resource allocation decisions in light of diverse demands on the resources involved.

Big game management is important to Alberta decision-makers, as is the hunting of that game. Efficient production requires knowledge of associated input and output prices or, in other words:

> An important function performed by resource prices in a free enterprise economy is that of allocating resources among different geographic areas in such a way as to increase the efficiency of the economy.[2]

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[1]Anthony Scott, Natural Resources: The Economics of Conservation (Toronto: University of Toronto Press, 1955), p. 18.

[2]R. H. Leftwich, The Price System and Resource Allocation (rev. ed.; New York: Holt, Rhinehart, and Winston, 1962), p. 320.

The hunting of big game involves both consumptive and non-consumptive uses. The non-consumptive uses can be referred to as "latent demand" or that demand which cannot be directly valued through attendance.[1] This latent demand has also been referred to as "option demand".[2] Decisions pertaining to the allocation of Alberta big game resources require reliable estimates of all or a good portion of the market and extramarket costs and benefits accruing to these resources, where market prices, per se, are not available. The following section is for the purpose of identifying the measurable benefits and costs accruing to big game hunting in Alberta.

Identification of Social Costs And Benefits

An efficient allocation of a given natural resource endowment requires an awareness of the benefits and costs accruing to each

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[1]McClellan and Medrich state that latent demand can take any of the following forms:

"1. demand that occurs when entrance fees to a facility are too high for all to afford;

2. demand for a facility that is relatively inaccessible to many who might like to attend; and

3. demand that cannot be measured because people are inarticulate about their recreation needs, have no knowledge of existing possibilities, or have no experience with some activities."

Keith McClellan and Elliott A. Medrick, "Outdoor Recreation: Economic Considerations for Optimal Site Selection and Development," Land Economics, Vol. 45 (1969), p. 175.

[2]John U. Krutilla, "Conservation Reconsidered," American Economic Review, Vol. 59 (1967), pp. 777-786.

alternative use for these resources, including both consumptive and non-consumptive benefits and costs. A technique of systematic analysis (referred to as benefit-cost analysis) has emerged within the last two decades to provide the decision-maker with a basic framework that could improve his perception of problems and the identification of alternative solutions. Moreover, Otto Eckstein suggests that:

> . . . the benefit-cost criterion, under ideal procedures, provides the same answer that the market mechanism would provide if it were free to function for collective goods.[1]

Ideal evaluation procedures do not, however, necessarily occur for collective goods with market (quantitative) and extramarket (non-quantitative) benefits and costs. The achievement of estimates for the extramarket portion is difficult, to say the least. However, it has been stated that:

> The complexities do not imply, by any means, that the analysis is useless--far from it--but they do imply that one must be discriminating about how and when to use the various tools.[2]

Wildlife resource evaluation is one case in particular where such complexities of systematic benefit-cost analysis arise, basically because the resources are collective by tradition and contain an element of intangible benefits and costs.

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[1]Otto Eckstein, Water Resource Development: The Economics of Project Evaluation (Cambridge: Harvard University Press, 1958), p. 39.

[2]Economic Council of Canada, Design for Decision-Making: Eighth Annual Review (Ottawa: Information Canada, 1971), p. 49.

The identification and measurement of at least a significant portion of the benefits and costs accruing to nonmarket or under-priced wildlife resources is of use to the public or government decision-maker. Krutilla suggests that:

> The central issue now seems to be the problem of providing for the present and future the amenities associated with unspoiled natural environments, for which the market fails to make adequate provision.[1]

Thus, the identification and quantification of <u>all</u> measurable benefits and costs, whether from the quantifiable portion or from estimated values, is imperative. Effective Alberta big game management requires that these benefits and costs be carefully outlined and compared to those of alternative uses for the resources involved. Alberta big game hunting benefits and costs, moreover, can be both primary and secondary in their incidence.

<u>Primary benefits</u> are those benefits which indicate the value of Alberta big game hunting to the individual hunters. They include:

1. direct benefits in the form of revenues from licence fees for big game, and
2. extramarket or intangible benefits accruing to the big game hunters.

A summation of these values for the individual hunters will give an estimate of the primary benefits from the big game hunting experience. The evaluation of primary benefits from a wildlife resource activity

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[1]Krutilla, <u>op. cit.</u>, p. 778.

is somewhat complicated in that the resources are not purchased by themselves and the hunter is restrained by the market mechanism from registering an accurate value for the activity. Alberta big game hunting is, in fact, a bundle or array of goods and services which the hunter purchases the right to use. Limited leisure time and bag limits constrain this use. The bundle of goods and services is underpriced in that hunters are constrained from participating in the activity up to the point where their marginal utility from the experience equals their marginal cost. In other words, licence fees do not reflect marginal cost. W. S. Pattison noted the problematic essence of this situation when he raised the following question:

> What is the true value to the consumer of one component of a purchased bundle of goods when that component is purchased at a lower price than would prevail in a competitive market?[1]

This serves to point out the critical nature of the extramarket component of primary benefits in evaluations. Several methods of evaluating extramarket benefits will be examined in the next chapter.

Secondary benefits result from the sale of goods and services to big game hunters in Alberta. These secondary benefits are only attributable to Alberta in the form of non-resident hunter expenditures made in the province. Resident expenditures are regarded merely as monetary transfers within the Alberta economy. The Secondary

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[1] W. S. Pattison, "Moose Hunting Activity in Northern Alberta: A Case Study in Wildlife Economics" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1970), p. 21.

benefits are inconsequential in value to society as a whole and the hunters themselves, as they are essentially a regional impact benefit. These benefits have recently been estimated through the use of an input-output-based services industry impact multiplier.[1] This technique of estimating the gross beneficial effects of non-resident expenditures has been adopted for the purposes of this study.

Primary costs are the administrative and management costs accruing to control of the various big game species in Alberta. Initially their incidence is on the taxpayer, but subsequently the costs are realized primarily through the sale of big game licences. This datum is not readily available in Alberta and must be estimated from gross management cost figures which can reflect interdepartmental and intradepartmental costs within the Alberta civil service.

Secondary costs are those costs absorbed by Alberta commercial enterprises to support the sale of goods and services to non-resident big game hunters. Only variable costs are considered, under the assumption that no expansion of facilities or hiring of extra labor was necessary for the provision of these goods and services in any given year. The expenditures would include:

1. those made on goods and services purchased in Alberta,
2. imported inputs, and
3. imported finished goods sold directly to the big game hunter.

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[1]See R. J. Miller, "An Economic Evaluation of Alberta's Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971), pp. 52-53.

They can be estimated, as are secondary benefits, through the use of an input-output-based multiplier.

The study at hand was concerned with the derivation of social net benefits from Alberta big game hunting for the following points of view:[1]

1. the individual hunters,
2. the Province of Alberta, and
3. society in general.

The viewpoint of the individual hunters would be such as to result in social net benefits equalling primary net benefits, since the evaluation wsuld be void of any indirect benefits or costs. This, in turn, leads to social net benefits equalling the extramarket component of the primary benefits, assuming that the recreation experience retains a value at least equivalent to the pecuniary costs incurred. The net benefits to society in general consist of licence fees and extramarket benefits, less administrative costs. Alternatively, the net benefits to Albertans consist of the net benefits to society in general plus net secondary benefits less the extramarket benefits of non-resident big game hunters. It is worth noting that the non-quantifiable benefits of Alberta big game hunting serve to indicate the fact that inclusion of extramarket benefit and non-licence cost estimates, may or may not underestimate the value of the activity.

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[1]Refer to Table 2 of this study for a breakdown of the benefits and costs accorded to each of these points of view.

Table 2

BENEFITS AND COSTS FOR THE INDIVIDUAL RECREATION EXPERIENCE, SOCIETY IN GENERAL, AND THE PROVINCE OF ALBERTA

Item	Individual Recreation Experience	Society in General	Province of Alberta
Primary or Direct Benefits	expenditures, licence fees, extramarket benefits	resident and non-resident licence fees, resident and non-resident extra-market benefits	resident and non-resident licence fees, resident extramarket benefits
Primary or Direct Cost	licence fees, expenditures	development, management, and operation costs for the resource	development, management and operation costs for the resource
Secondary or Indirect Benefits	--	--	multiplier impact of non-resident expenditures
Secondary or Indirect Costs	--	--	extra expenditures incurred as a result of sales to non-residents
Net value	net value of the individual recreation experience	net social value to society in general	net social value to the Province of Alberta

Source: Adapted from: J. Snipe, "The Ecological and Economic Impact of Water Resource Development in Southern Alberta: The Case of Fish and Wildlife" (unpublished M.Sc. thesis, University of Alberta, 1970), p. 43, Table 3.

Aesthetic and other intangible benefits and costs do not lend themselves easily to estimation and are characteristic of collective or public goods.

Evaluation of Underpriced Resources

Big game hunting in North America, and more particularly in Alberta, is by tradition a collective or public good, but is by nature divisible in consumption. Lacking the price base provided by the private market mechanism, the "price" of big game hunting is inadequately reflected by the licence fees charged for the opportunity. In other words:

> Fees cannot be taken as equivalent to the value of rights conferred on users.[1]

The rationing effect of prices is lacking in the market system of resource allocation. Therefore, the activity is in a sense underpriced and the inclusion of an extramarket benefit estimate for this activity would be an attempt to determine an approximate market price substitute for decision-making purposes.

The evaluation of outdoor recreation resources has received

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[1] C. W. Loomer, "Recreation as a Field for Economic Analysis" (paper prepared for a seminar, Great Plains Resource Economics Committee, Economics Department, South Dakota State College, Brookings, September 27, 1961), p. 15. (Mimeographed).

considerable attention over the years.[1] Unfortunately, in light of the significant intangible considerations, most attempts at evaluation have failed to provide a technique that adequately represents the recreational value of the resources.[2] This lack of a universally accepted method has recently led to the development of methods related to the recreational experience, per se, including at least a rough estimate of extramarket value.

Recent extramarket evaluation methods related to underpriced resources are generally referred to as direct and indirect methods. They are oriented towards the construction of a demand relationship, from which the quantity of use can be indicated for various "price" levels or additional toll charges. The direct methods are based on questioning individual recreationists as to how much they would be willing to pay for access rather than be excluded or, alternatively, the minimum bribe they would accept to abstain from participation.[3] Pearse identifies the former, or open-ended question technique, as

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[1] For example: R. A. Prewitt, "The Economics of Public Recreation--An Economic Study of the Monetary Evaluation of Recreation in the National Parks", National Park Service, Department of the Interior, 1949; and A. M. Trice and S. E. Wood, "Measurement of Recreation Benefits," Land Economics, Vol. 34 (1958), pp. 195-207.

[2] See Appendix A of this study for a brief description of some evaluation methods found in the literature.

[3] See Jeff Romm, The Value of Reservoir Recreation, Technical Report No. 19 (Ithaca, New York: Cornell University Water Resources and Marine Sciences Centre and Department of Agricultural Economics, 1969), pp. 27-36, for a description of these techniques of evaluation.

measuring the Hickian "compensating surplus" and the latter, or bribe technique, as measuring "equivalent surplus".[1] These direct methods have significant weaknesses related to the questionable reliability of answers to hypothetical questions and the presence of response bias created by the thought of government involvement and possible ramifications. The individual's interpretation of the role of government in providing a given recreation opportunity and his willingness and ability to pay for the access provided are prime motivational factors in regards to responses given. The use of these methods generally entails the assumption of equal incidence of these motivational factors on the users.

The indirect approaches to evaluation of the extramarket benefits derived from underpriced resources attempt to estimate willingness to pay on the basis of observed behaviour. Estimates from these methods involve:

> . . . stratifying the recreationists into groups defined by hypothesized similarity of preference for money versus recreation.[2]

Each delineated grouping requires examination under the assumption that all individual recreation units are equal in worth to each consumer of the recreation experience, and a marginal consumer can thus be identified for each stratum. The major weaknesses in these approaches

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[1]Peter H. Pearse, "A New Approach to the Evaluation of Non-Priced Recreational Resources," Land Economics, Vol. 44 (1968), p. 88.

[2]Pattison, op. cit., p. 24.

lie in the necessary implicit assumptions regarding the homogeneity of the selected stratum, the homogeneity of the recreation units, and the response to an increase in toll charges or fees as increased access costs.

For the evaluation of Alberta big game hunting activity in this study, one direct method and two indirect methods were selected. The direct method adopted was one involving a maximum tolerable price statement over and above consideration of actual cash costs.[1] The indirect methods selected were the Hotelling-Clawson approach,[2] using distance travelled as a proxy for price, and the Pearse approach,[3] using income as a proxy for price. The following chapter provides a more exhaustive critique of the selected methods and examines the data base and study procedure for the evaluation of Alberta big game hunting.

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[1]This is the same methodology for extramarket evaluation used by Miller, op. cit.; Pattison, op. cit.; and Snipe, "The Ecological and Economic Impact of Water Resource Development in Southern Alberta: The Case of Fish and Wildlife" (unpublished M.Sc. thesis, University of Alberta, 1970).

[2]This method is essentially based on the following papers: A letter from Harold Hotelling reported in Prewitt, op. cit., and Marion Clawson, Methods of Measuring the Demand for and Value of Outdoor Recreation, Reprint No. 10 (Washington, D.C.: Resources for the Future, Inc., 1959).

[3]Pearse, op. cit., pp. 87-99.

CHAPTER III

EVALUATION METHODS AND SURVEY EXAMINATION

Hotelling-Clawson Method

Various alternative evaluation methods have been proposed in recent years for the evaluation of outdoor recreation resources. The relevance to conventional price theory of the evaluation of underpriced resources has been a more recent concern. Knetch and Davis suggest that:

> It is our view that, by and large, recreation is a consumption good rather than a factor of production, and the benefits to be enjoyed are largely those accruing to the individual consumer participating. The large bulk of primary recreation benefits can be viewed as the value of the output of the project to those who use them. This view stems from the concept that recreation resources produce an economic product. In this sense they are scarce and capable of yielding satisfaction for which people are willing to pay.[1]

The measurement of consumer's surplus in the form of extra-market benefits emerges as a critical factor in these evaluations. Among the various methods that have been proposed, that method referred to as the Hotelling-Clawson method has received considerable attention.[2]

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[1]Jack L. Knetsch and Robert K. Davis, "Comparison of Methods for Recreation Evaluation," Water Research, Allen V. Kneese and Stephen C. Smith, eds. (Baltimore: The Johns Hopkins Press, 1966), p. 128.

[2]For example, see: Jeff Romm, The Value of Reservoir Recreation, Technical Report No. 19 (Ithaca, New York: Cornell University Water Resources and Marine Sciences Centre and Department of Agricultural Economics, 1969); and Knetsch and Davis, op. cit.

The major impetus for the method was provided by Harold Hotelling, who suggested both the definition of concentric zones about a recreation site so that the travel costs from all points within these zones are equal, and the use of these travel costs and related attendance figures to derive a demand schedule.[1] Marion Clawson later gave these ideas a new interpretation.[2] Jeff Romm described the method in the following manner:

> It uses recreationists' excursion costs as a proxy for the price of the experience and the per capita attendance at a particular site from different population zones as an index of quantity of recreation consumed. Costs are calculated from distances travelled and expenditures made.[3]

The relationship between excursion costs (made up primarily of travel costs) and per capita attendance enables one to construct a demand schedule for the whole outdoor recreation experience. The total recreation experience is composed of anticipation, travel to and from the site, the 'on-site' experience, and recollection.[4]

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[1] Roy A. Prewitt, The Economics of Public Recreation--An Economic Study of the Monetary Evaluation of Recreation in the National Parks, National Park Service, Department of the Interior, 1949.

[2] M. Clawson, Methods of Measuring the Demand for and Value of Outdoor Recreation, Reprint No. 10 (Washington, D.C.: Resources for the Future, Inc., 1959).

[3] Romm, op. cit., p. 15.

[4] See Marion Clawson and Jack L. Knetsch, Economics of Outdoor Recreation (Baltimore: The Johns Hopkins Press, 1971), pp. 33-36, for a discussion of this.

Clawson further extended the analytical potential of his interpretation when he related that:

> Estimation of the demand curve for a recreation area must, we believe, proceed in two stages: one curve for the total recreation experience, a second one for the recreation opportunity per se. The first can be estimated from the actual experience of considerable numbers of people engaged in outdoor recreation; the second can be derived from the first.[1]

The demand for the recreation opportunity per se is, in fact, the response of per capita attendance at the recreation site to different additional hypothetical tolls or fees. The hypothetical tolls are potential added entrance fees which can be charged for access to the recreation site. These charges are expected to reduce the number of visitors from each of the concentric zones and thus reflects their willingness to pay.

The visitors to a given recreation area or site are stratified according to distance travelled for the purposes of determining the marginal consumer(s) of the recreation experience. Identifying the marginal consumer(s) is necessary for the determination of any consumer's surplus accruing to the recreation activity. Those living closer to the site will incur lower access costs than those living in outlying zones. Thus, the former enjoy a consumer's surplus over the latter. In the Hotelling-Clawson approach, consumer's surplus is

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[1]Clawson, op. cit., p. 13.

defined as the difference between the average costs incurred and the average costs of the marginal consumer. The marginal consumer is identified as that consumer coming from the furthest zone. The consumer's surplus is estimated by assuming that the additional hypothetical tolls for the opportunity per se are adjusted successively by the differing average costs per visit for the selected distance zones. The measured consumer's surplus is thought to be equivalent to the extramarket benefit component of the recreation resource, or the difference between the actual access costs and the value placed on the resource by the user. Thus, this method can be utilized in the evaluation of underpriced resources, in the determination of their most efficient allocation, and in the incidence of their costs and benefits.

However, use of the Hotelling-Clawson method requires several qualifying assumptions. They are outlined as follows:

1. Travel costs are fairly constant for participants from each distance zone.
2. The recreationists would respond to a toll on access to the recreation site as they would to an equivalent addition to excursion costs.
3. The individual participants and the populations which they are drawn from have similar characteristics and preferences regarding money and recreation.
4. The recreation site is the major destination and primary purpose of the trip.

5. The recreation units are of a homogeneous nature with identical alternatives existing for all participants.

6. The disutility of overcoming distance is solely a function of monetary cost.

These assumptions lead to various weaknesses in the reliability of estimates derived from this approach. For instance, the assumptions of homogeneity for participants, base populations, and recreation units are somewhat restrictive. They tend to subordinate the difficulties in specifying the effects of the different identifiable variables because of multi-collinearity between such variables as distance, time, and cost, as well as the difficulties encountered in attempting to measure such things as intensity of use, site quality, and alternative availability. A marginal unit of recreation can be a variable package or good and the recreationist, an individual, but the homogeneity assumptions are required in order to base estimates on similar attributes with respect to excursion costs experienced by the recreationists from each distance zone.

Of the remaining assumptions, that concerning the equivalence of travel costs is the most acceptable, considering that the automobile is perhaps the most common mode of travelling to a recreation site. Automobile expenses can be regarded as being similar over equivalent distances. The assumption regarding response to additional tolls is also quite reasonable, although distortions can arise from a localized activity. Romm considered this problem and suggested that:

> Local recreationists do not seem to value entrance fees in the same way they value additional expenditures for fuel . . . The implication is that the marginal valuation of money differs between recreational expenses for travel and for park entrance.[1]

In other words, the demand schedule for the recreation opportunity per se is quite elastic over the range of small hypothetical fees, and a small change in toll will lead to a greater than proportional change in local resident demand.

The sole purpose assumption is quite acceptable for some recreation activities.[2] Contradictions can arise in instances where utility or disutility is derived from other activities enroute or from the trip itself. The assumption that the disutility of overcoming distance is only a function of monetary cost can lead to a consistent bias in the estimations of value. Most likely, the disutility is directly related to money costs, the costs of time spent in travel, and the net utility of the travel experience.[3]

The Hotelling-Clawson method was selected for comparison with other methods of evaluating the extramarket benefit component of

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[1]Romm, op. cit., p. 16.

[2]It should be noted here that in relation to his study of East Kootenay big game hunting, Peter Pearse indicated that 94.5 percent of the hunters fulfilled the sole purpose assumption. P. Pearse, "A New Approach to the Evaluation of Non-Priced Recreational Resources," Land Economics, Vol. 44 (1968), p. 97.

[3]A discussion of possible time bias in estimation techniques is undertaken in Appendix B.

Alberta big game hunting.[1] The selection was based on an assumption that Alberta big game hunters are motivated in their attendance to a significant degree by distance differentials and the associated per visit costs. The per visit costs are specified to include travel costs to and from the site, licence fees, the costs of guide service, ammunition, lodging, and other associated costs incurred, but not directly related to, the distances travelled by the hunters. In this study, user demand schedules are constructed on a regional basis for the "total recreation experience", and from these are derived functional relationships between attendance and additional hypothetical fees.[2] Moreover, the big hunters from tributary distance zones (both resident and non-resident) are assumed to have similar physical and social mobility, tastes and preferences, accessibility, knowledge of opportunities, and alternative availability.

A significant alteration was inserted into the basic Hotelling-Clawson approach for this study. This is the selection of the number of trips to the hunting site as the relevant quantity variable (rather than per capita attendance) for the distance zones.

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[1]This involves the derivation of the user schedule(s) for the recreation opportunity per se and the calculation of the extramarket component utilizing the additional hypothetical tolls and estimated attendance utilizing number of trips.

[2]The rationale for a regional approach and the regional selection are discussed later in this chapter.

The assumption of homogeneity of actual users seems preferable to the more questionable assumption of homogeneity of whole base populations. Furthermore, one of the purposes of this study is to evaluate 1969 big game hunting and not to predict future demand, for which the latter assumption might perhaps be more useful. With the aforementioned assumptions and alteration in mind, it is possible to derive extramarket benefit estimates for 1969 Alberta big game hunting for comparison with the alternative selected methods.

Pearse Method

In reaction to what he referred to as "the restrictive assumptions of established methods",[1] Peter H. Pearse proposed a methodology based on the measurement of the individual recreationist's consumer surplus. The method requires the stratification of participants on the basis of selected income groupings and the estimation of total fixed costs per trip attributable to the recreation experience for each participant. In other words, the price variable of the demand schedule for the activity is total fixed costs per trip, according to which recreationists will adjust their attendance. The total fixed or access costs include travel costs to and from the recreation site, a crude estimate of the value of travel time accruing to the experience, and all other expenses incurred

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[1]Pearse, _op. cit._ p. 90.

specifically from the recreation activity. These costs are, in a sense, fixed in that they are accepted as not being dependent upon the volume of use.

For the purposes of constructing a demand schedule for the total recreation experience, a ranking must be undertaken on the basis of access costs experienced within each income group. The recreationist with the highest fixed costs per trip in a given income group is defined as being the marginal consumer in that group. This is the framework within which the analysis is carried out. It requires that:

> Each intramarginal recreationist (x) in this group will continue to purchase recreation until his fixed cost is raised to exceed that of the marginal visitor.[1]

Thus, the consumer's surplus (or maximum additional fee that the recreationist would accept) is the difference between his total fixed costs per trip and that of the marginal consumer in the same income group. The measured surplus is a compensating surplus or "the amount by which his income would have to be reduced in order to leave him at the same level of indifference while purchasing recreation as he would be without the opportunity. . . ."[2]

The basic method, as outlined, requires the following qualifying assumptions:

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[1] Pearse, op. cit. p. 92.

[2] Ibid., p. 91.

1. Recreationists will react to a hypothetical toll charge as they would to a similar increase in fixed costs.
2. The interdependence between recreationists is negligible over the range of use under consideration.
3. Recreationists with similar incomes have identical indifference maps and parallel market opportunity lines.
4. The recreation experience is the sole purpose of travel to the recreation site.
5. The recreationist with the highest per trip fixed costs in a given income group is the marginal consumer of the recreation experience within that group.
6. Each recreationist has achieved equilibrium in the allocation of his available time between the given recreation activity, work, and other forms of leisure.

These assumptions are necessary for the Pearse method of evaluating outdoor recreation resources, but are not beyond criticism. For instance, it is somewhat arbitrary to suggest equal willingness to pay on the basis of income similarity when each recreationist can have a unique array of tastes and preferences and faces different alternative opportunities. Pearse qualified his acceptance of this assumption by saying that:

> . . . within a given income group participating recreationists are evenly distributed among areas offering substitutes of differing quality, and that the recreationist with highest fixed costs faces alternatives of average quality.[1]

To accept this assumption for participating recreationists is preferred to homogeneity assumptions related to whole base populations or areas, as with the Hotelling-Clawson method. Moreover, some assumptions regarding homogeneity are desired for indirect methods of evaluating underpriced resources. Norton pointed this out when he said:

> Since the assumption of homogeneity can be interpreted as implying that all estimations to derive a demand schedule are, in fact, on the same demand function, it is evident that where any attempt is made to quantify consumer's surplus, assumptions concerning the homogeneity of the population or sections of it have to be made.[2]

The most prevalent weaknesses of the Pearse method, however, are found in the selection of the marginal consumer in each income group and the selection of the income groups themselves. The income groups are expected to be small enough to select those recreationists with similar willingness to pay and large enough to include the marginal individual. There should be enough observations to ensure that at least one recreationist is included close to the margin. However, it is possible that the intramarginal buyer of one selected

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[1]Pearse, op. cit., pp. 94-95.

[2]G. A. Norton, "Public Outdoor Recreation and Resource Allocation: A Welfare Approach," Land Economics, Vol. 46 (1970), pp. 414-415.

income group can be the marginal consumer of an alternative income grouping and vice versa. Pearse regarded these possibilities as contributing to a conservative estimation of consumer's surplus. He suggested that:

> . . . we can assert that the assumption about the marginal status of the highest cost individual in each group means that the calculated value of the resource is in the nature of a lower limit to its real value, particularly if data on only a sample of the population of recreationists are available. This follows from the likely possibility that the highest-cost individual himself is intramarginal in the sense that he enjoys consumer surplus.[1]

The constraints of the remaining assumptions are somewhat minor in comparison to those of homogeneity and the selection of marginal consumers and income groups. The assumption of hypothetical fees inducing reactions similar to those from additional fixed costs is considered reasonable since additional licence fees as tolls are regarded as fixed costs attributable to the recreation experience. It is possible, however, for a distorted view to be derived from the inclusion of local residents in the recreation activity.[2] The assumption of negligible consumer interdependence is accepted because there is no reason to expect those recreationists not participating at a given fee level to attend in view of an additional hypothetical toll. Acceptance of this assumption tends to detract from the possibility that the recreationist's tastes, preferences, income and

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[1]Pearse, op. cit., p. 95.

[2]See Romm, op. cit.

willingness to pay can be dynamic in nature. The acceptability of the sole purpose assumption can also be questioned in cases where the purpose of a trip is to include several alternative activities or where unexpected alterations in the original plan occur during the course of the journey. Also, the achievement of equilibrium in time allocation is not altogether acceptable. It is restricted because it would require that time was perfectly divisible, that time spent in travel was marginal, and that the achievement of time allocation equilibrium was feasible. This is necessary, however, to include a time cost element in the estimation of total access costs accruing to the recreation experience.

The Pearse method is, in essence, a modification of the Hotelling-Clawson approach to evaluation of the consumer's surplus accruing to outdoor recreation activities. Norton pointed out that:

> . . . in eliminating the doubtful assumption concerning the homogeneity of the base populations, essential for Clawson's analysis, Pearse merely diverts this fundamental assumption to income groups with the supposition that visitors within the same income category have identical indifference maps for recreation.[1]

The similarities between the two methods do not, however, extend to the inclusion of the identification of the marginal consumer(s) of the activity or the price and quantity variables of the demand schedule. The Hotelling-Clawson approach selects the recreationist

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[1]Norton, op. cit., p. 414.

from the furthest distance zone as the marginal consumer, whereas Pearse selects the person with the highest fixed costs in each income grouping. Average costs per trip and per capita attendance characterize the Hotelling-Clawson method while total fixed costs per trip and attendance characterize the Pearse method.

For the purposes of this study, Pearse's analytical technique for the evaluation of East Kootenay big game hunting has been adopted with several alterations. The evaluation of big game hunting in Alberta is to include non-resident hunters, whereas Pearse only surveyed resident big game hunters. Thus, a non-resident hunter can be the marginal consumer within a given income category or can enjoy a consumer's surplus. A further alteration comes with the consideration of multiple trips to the recreation site in constructing a user demand schedule for the total recreation experience. The price variable would then become the total fixed costs incurred for big game hunting over the whole hunting season and the quantity variable would be actual hunter attendance. Therefore, it is possible for the highest fixed costs in a given income group to be the result of a big game hunter making more than one trip to the hunting area. The other alteration to Pearse's basic method is the exclusion of the cost estimates for Alberta big game hunting. To date the literature in this area is not conclusive as to the nature of time costs to be used for recreation benefit estimations.[1] Moreover, the survey

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[1] See Appendix B for a discussion of this.

questionnaire utilized for this study did not include any question related to the time spent in travel and its related costs, although it surveyed time spent at the hunting site.[1] Only very crude time cost estimates could have been derived from the available data.

Upon considering the qualifying assumptions and the alterations specified for the evaluation of Alberta big game hunting, it was felt that a comprehensive evaluation could be derived from the data on hand using the Pearse method.

Direct Method

In recent years, an evaluation method has been developed based on asking recreationists how much they value the right to participate in a given recreation activity over and above the direct cash costs of that activity. Two approaches have been utilized to estimate this value. One is to measure recreationists' compensating surplus by using an open-ended question to enquire about their willingness to pay rather than forego the opportunity completely. Alternatively, the recreationists are asked to indicate their equivalent surplus or the minimum amount of bribe they would accept for not participating in the recreation activity. These are two different types of consumer surplus and are not valued equally. Pearse suggested that:

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[1]See the questionnaires in Appendix E of this study.

> We can assert, however, that as long as recreation can be regarded as a 'normal' good, the 'equivalent variation' will always exceed the 'compensating surplus.'[1]

The structure of the evaluation question in the 1969 hunting survey was such as to preclude the idea that the consumer surplus measured by the direct method was a compensating surplus.

The direct methodology and its alternative application techniques have been amply discussed elsewhere.[2] In these direct methods, economists have recognized the potential of sample surveys utilizing self-administered questionnaires or direct personal interviews. However, the reliability of the technique does vary with the character of the questions asked, the manner of presentation, and the qualifying assumptions which are required.

There are several necessary assumptions when using direct methods for evaluating underpriced outdoor recreation activities. They are outlined as follows:

1. The value of the recreation experience equals or exceeds the costs to the recreationist.
2. Persons responding identically to the same evaluation questions derive the same level of recreation benefits from the experience.

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[1] Pearse, op. cit., footnote 11, p. 91.

[2] See Romm, op. cit., pp. 27-51 and Knetsch and Davis, op. cit., pp. 130-137.

3. The recreation activity itself is the only portion of the recreationist's product-mix from the recreation trip which is not purchased in a competitive market.
4. The surveyor and the survey method have a neutral effect on the recreationist's responses.

The assumption that benefits at least cover costs is thought to be reasonable, in that it is not likely that a consumer would take part in a recreation activity without expecting to derive the equivalent value of his access costs from the recreation experience. However, the possibility does exist that individual recreationists can derive a negative utility or disutility from a recreation activity. The evaluation question in this study was structured to allow for such an occurrence by including an opportunity for indicating an estimated daily value besides those suggested. The assumption with regards to identical responses is necessary for the establishment of a certain degree of confidence in the solicited responses. Also, the assumption of a single non-competitively priced good--the recreation experience--is required. Distortions in the results might occur if more than one good purchased on the recreation trip was characterized by an extramarket value component.

The major weakness of the direct method can be found in the assumption regarding the effects of the surveyor and the survey methods on the responses. Emotional and political biases can emerge in self-administered questionnaires as well as in personal interviews.

For instance, an expectation of higher entrance fees could lead to a conservative evaluation, while conservationists might overvalue the activity due to its emotional appeal. However, the assumption is necessary for establishing the consistency of the responses generated.

The assumptions required for the direct method appear to be less numerous and restrictive than those of the Pearse and Hotelling-Clawson methods. The desirability of a technique such as the direct method as opposed to indirect techniques was alluded to by Hines, who suggested that:

> What is needed to appraise such recreational benefits is a way to discriminate between various users and to sum up the individual evaluations--not to assume an artificial constancy of reaction.[1]

The direct method selects the individual evaluations for summation in the determination of extramarket benefits accruing to a recreation activity.

The study at hand is based on a mail questionnaire survey of 1969 hunters and sport fishermen in Alberta. The questionnaire included an evaluation question designed to elicit relatively unbiased estimations of the extramarket benefits accruing to Alberta

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[1] L. G. Hines, "Measurement of Recreation Benefits: A Reply," Land Economics, Vol. 34 (1958), pp. 365-367.

big game hunting.[1] The hunters were asked to select one of the suggested dollar values as being representative of the worth of a day's big game hunting above travel and other expenses incurred specifically for that experience. Estimation variation of a day's worth above or below the suggested values was allowed for. From the responses of the hunters, a demand schedule could be constructed to illustrate the reactions of big game hunters in Alberta to various hypothetical fees under conditions of free access. Thus, the extra-market component of Alberta big game hunting activity can be estimated through the use of the direct method outlined in this study.

Sampling Procedures

The selection of a representative sample of big game hunters for this study required the subsampling of all licenced big game hunters from the 1969 survey of Alberta hunting and sport fishing. Selection in the original survey was based on the fact that all hunters were required by law to purchase a wildlife certificate for two dollars. Therefore, the total number of resident and non-resident hunters was equivalent to the total number of certificates sold--117,408 in 1969 (Table 1). The names and addresses of the registered

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[1]See R. J. Miller, "An Economic Evaluation of Alberta's Sport Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971), for the relevant resident and non-resident hunter evaluation questions.

hunters were obtained by a one in ten systematic random sampling of wildlife certificate counterfoils. A starting point was randomly selected and the names and addresses were taken for every tenth counterfoil after that point. The details of the hunter population size, sample size, and hunter response to the mail survey are given in Table 3.

Sampling of the wildlife certificate counterfoils resulted in a 9.7 percent sample of 1969 resident and non-resident hunters being included in the survey.[1] However, the usable sample obtained was only 2.1 percent of the resident hunter population and 3.8 percent of the non-resident hunter population. Depletions from the original sample were attributed to questionnaires returned unopened, questionnaires not returned at all, and those which were either partially or totally incomplete. Also, several of the questionnaires returned indicated that those respondents had purchased a licence but had not hunted during the 1969 season.[2]

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[1]Less than a 10 percent sample was obtained because all counterfoils had not been returned to the Fish and Wildlife Division when the sampling was done. The unreturned counterfoils were accepted as being a random subset of the total hunter population and therefore the sample randomness remained intact.

[2]This is an indication of option demand, as discussed previously. In this study 156 resident and only 1 non-resident hunter were found to have done so. It should be noted that in a relatively large number of these cases, the evaluation question was answered although they reported no hunting of big game. This may be attributable to a misunderstanding of the question or to an incomplete questionnaire.

Table 3

HUNTER POPULATION, SAMPLE SIZE, AND RESPONSE TO THE MAILED QUESTIONNAIRE, 1969

	Resident Hunters	Non-Resident Hunters
Hunter Population	109,835	7,573
No. Samples	10,678	736
Percent Samples	9.7	9.7
Questionnaires Ret'd Unopened	514	48
Effective Sample Size	10,164	688
Effective Percent Samples	9.3	9.1
Questionnaires Returned	2,788	342
Percent of Effective Sample Ret'd	27.4	49.7
No. Usable Questionnaires	2,267	288
Percent Usable of Effective Sample	22.3	41.8
Usable Quest. as % of Population	2.1	3.8

Source: R. J. Miller, "An Economic Evaluation of Alberta's Sport Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971), Table 3, p. 19

Table 4

USABLE BIG GAME HUNTER QUESTIONNAIRES AS PER SELECTED METHODS

	Direct	Pearse	Hotelling-Clawson
Resident	1,186	1,310	1,537
Non-Resident	127	148	159

For the purposes of this study, the hunting portion of the 1969 survey was accepted as a representative and random sampling. Therefore, the selection of a licenced big game hunter subsample was taken to represent a random sampling of 1969 big game hunters. Table 4 indicates the number of usable questionnaires for each of the selected methods.

These figures for usable sample size differ from the basic licenced big game hunter selection of 1,693 resident and 163 non-resident hunters, for several reasons. They differ because of incomplete questionnaires in relation to data requirements, as well as the existence of a significant number who held a big game licence but did not hunt big game in 1969. Thus, the usable sample size differed between methods but the randomness of the original survey sample was assumed to hold in all three cases.

Data Reliability and Analytical Procedures

The survey from which big game data were derived for this study involved a self-administered mail questionnaire. Surveys of this type are subject to both response and non-response bias. Response bias is introduced by respondents who incorrectly report the details of their big game hunting activity or misinterpret the questions asked of them. Errors of this type can be minimized by designing a more effective questionnaire and ensuring that the sampling is done as soon as possible after the activity is concluded. These procedures were observed in the 1969 hunters survey, although a larger usable

sample would have been preferred. The actual number of respondents in these self-administered questionnaires is dependent upon:[1]

1. the population being surveyed,
2. the subject of the survey,
3. the sponsorship of the survey,
4. the questionnaire length,
5. the attractiveness of the questionnaire, and
6. the ease with which the questionnaire can be completed and returned.

Response bias can result from the negative effects of any one or a combination of these factors on the sample population. Their impact is considered neutral for this study.

Non-response bias is that exhibited by individuals having certain characteristics which might cause them to be less responsive to the self-administered questionnaire than others. Bias of this type was thought to exist in the 1969 hunting survey. A follow-up sample was administered in a similar 1968 survey in order to identify any non-response bias that might be present.[2] It was found to exist at the 95 percent confidence level for lodging expenditures, ammunition

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[1] Douglas Crapo and Michael Chubb, Recreation Area Day - Use Investigation Techniques: A Study of Survey Methodology, Technical Report No. 6 (East Lansing: Recreation Research and Planning Unit, Department of Parks and Recreation Resources, Michigan State University, 1969), pp. 20-21.

[2] Miller, op. cit., p. 22.

expenditures, and extramarket benefits.[1] None was evident for hunter age, education, and income, or for licence costs, vehicle rentals, guiding costs, and distance travelled. The mean value of the extra-market benefits given was higher in the follow-up sample. Thus, it is noted that the 1968 and 1969 surveys of Alberta's hunting and fishing activities evoked rather conservative estimates of extramarket benefits and that the estimates for big game hunters would thus be lower than the actual value. By recognizing the various possible biases associated with this survey type, it was hoped to reach sensible conclusions as to the quality and value of the basic data.

In this study, the data for resident and non-resident big game hunters are presented separately for purposes of comparison. The data are further broken down into nine defined regions of Alberta (Figure 5), constructed on the basis of wildlife management units[2] in the province for an indication of the distribution of big game hunting activity as well as its associated benefits and costs. The following information was felt to be necessary to meet the requirements of the three methods as outlined as well as to provide a regional breakdown of estimates and specific big game hunter characteristics:

1. per day extramarket evaluations,

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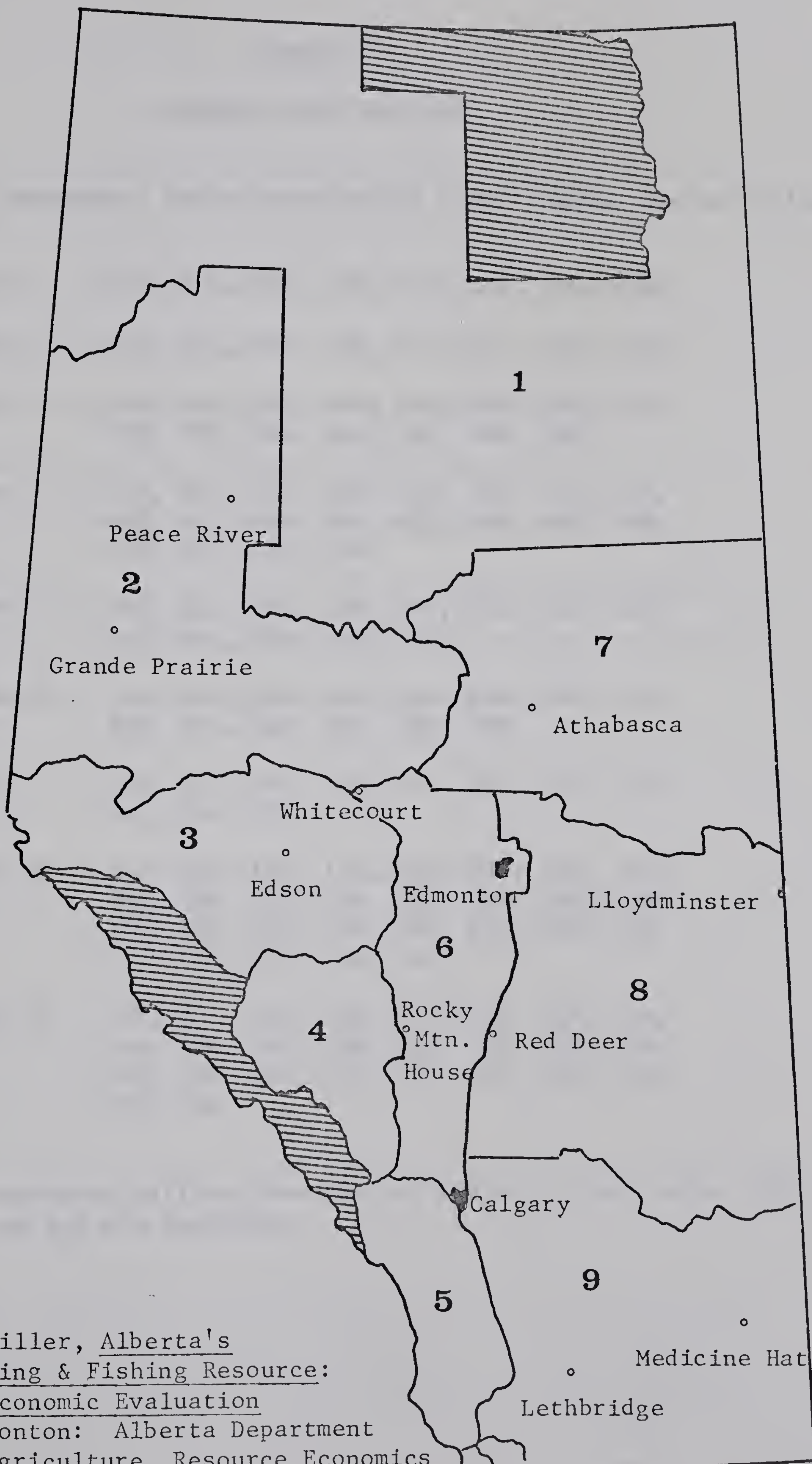
[1]The T-test statistic and the chi-square statistic were used in the determination of non-response bias.

[2]See page 55 for a breakdown of the wildlife management units making up these regions.

Figure 5

DEFINED STUDY REGIONS



Source: R. Miller, Alberta's Hunting & Fishing Resource: An Economic Evaluation (Edmonton: Alberta Department of Agriculture, Resource Economics Branch, 1971).

Table 5

DEFINED STUDY REGIONS

The wildlife management units constituting these regions are as follows:

Region 1:	518, 520, 528, 530, 532, 534, 536, 538.
Region 2:	350, 354, 356, 358, 445, 522, 524, 526.
Region 3:	338, 340, 342, 344, 346, 348, 352, 436, 438, 439, 440, 441, 442, 444, 446.
Region 4:	316, 318, 324, 326, 328, 330, 412, 414, 416, 417, 418, 420, 422, 424, 426, 428, 429, 430, 432, 434.
Region 5:	300, 302, 304, 306, 308, 310, 312, 400, 402, 404, 406, 408, 410.
Region 6:	212, 214, 216, 221, 224, 246, 248, 314, 320, 322, 332, 334, 336, 508.
Region 7:	258, 260, 500, 502, 504, 506, 510, 511, 512, 514, 516.
Region 8:	158, 160, 162, 164, 166, 200, 202, 204, 206, 208, 210, 218, 220, 222, 226, 228, 230, 232, 233, 234, 236, 238, 240, 242, 244, 250, 252, 254, 256.
Region 9:	102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 156.

Note: This breakdown differs from that of Miller in that units 208, 444, and 446 are included.

2. days hunted big game,[1]

3. the approximate income level of each hunter,

4. associated big game hunting expenses per hunter,

5. residences of non-resident big game hunters,

6. distances travelled to and from the various hunting areas,

7. big game licences held for each hunter,

8. reported personal evaluations, and

9. socioeconomic characteristics.

The information is required and in some instances is essential for a realistic evaluation of 1969 Alberta big game hunting to Albertans, society in general, and to the hunters themselves.

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[1]Trips reported for both big and bird game hunting were to be broken down to 50 percent big game and 50 percent bird game days rather than exclude them from consideration. See Table C-13, Appendix C for an indication of the magnitude of this occurrence.

CHAPTER IV

EVALUATION OF ALBERTA BIG GAME HUNTING, 1969

Big Game Hunting Activity, 1969

Hunters of big game in Alberta during the 1969 season were estimated to have spent approximately 474,000 days engaged in this activity. Of this total, 94 percent was found to be attributable to resident hunters and the remaining 6 percent to non-residents. However, non-resident big game hunters averaged approximately 6.6 days in the activity while resident big game hunters averaged only about 5.4 days per hunter.

On a provincial basis, big game hunting was estimated to compose around 57 percent of the total hunting activity in the province for that year, based on days hunted.[1] It was found to be the most significant hunting activity in regions 1 through 6, while hunting in the remaining regions consisted primarily of other forms of hunting activity (i.e., upland bird game and waterfowl). Regions 1 through 6 were estimated to have contributed 80.5 percent of the provincial total of big game hunting days (Table D-3, Appendix D). The primary focus of the estimated 82,000 resident and 4,000 non-

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[1]See Table D-4 in Appendix D for a regional breakdown of big game and overall hunting activity, as well as the provincial totals.

resident big game hunters was essentially those areas of Alberta located west of a Calgary-Edmonton line running north to south through the province and the northeast corner of Alberta.

The success of these hunters in bagging big game animals can be allocated on the basis of reported numbers and types bagged in relation to the number and type of game licences issued. Table 6 gives estimated resident success rates for 1969.[1]

In Table 6, the mail survey's success rates contributed to the estimation of the total game kills with respect to moose, whitetail deer, mule deer, and elk species during the 1969 hunting season (Table 7).

Tables 8, 9, 10 and 11, respectively, give a regional breakdown of the estimated kills for these four major big game species which are indigenous to Alberta. These tables indicate that the harvest of moose was predominantly associated with regions 2 and 3, the harvest of elk with regions 3 and 5, the whitetail deer harvest with 6 and 8, and the mule deer primarily with regions 2, 3, 5, 6, 8, and 9. This type of information (success rates and estimated harvests) combined with estimates of hunter density on a regional basis can be considered critical for the construction of an effective game management program, for the hunters' benefit rather than for a habitat management program, for example.

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[1]Non-resident success rates are unavailable due to the non-specificity of their licence categories as well as the failure of the questionnaire to account for the discrepancy.

Table 6

RESIDENT BIG GAME HUNTER
SUCCESS RATES, 1969

Species	Mail Survey (%)	Fish and Wildlife Estimates (%)
Moose	35.7	-
Whitetail Deer	26.7	-
Mule Deer	26.1	-
Elk	13.2	-
Antelope	-	-
Sheep	36.1	13.5
Goat	-	37.3
Caribou	42.3	-

Source: R. J. Miller, "An Economic Evaluation of Alberta's Sport Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971), Table 5, p. 38.

Table 7

ESTIMATED GAME KILLS, PROVINCIAL TOTAL, 1969

Species	Resident	Non-Resident	Total
Moose	17,713	2,448	20,161
Elk	3,622	211	3,834
Whitetail Deer	11,549	53	11,602
Mule Deer	10,792	26	10,818

Source: R. J. Miller, "An Economic Evaluation of Alberta's Sport Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971), Table 6, p. 39.

Table 8

THE DISTRIBUTION OF MOOSE HARVEST

Region	Estimated Harvest, 1969 Residents	Non-Residents	Total	Percent of Prov. Total
1	745	53	798	4.0
2	7,241	1,869	9,110	45.2
3	4,511	316	4,827	23.9
4	1,035	26	1,061	5.3
5	1,076	-	1,076	5.3
6	1,159	26	1,185	5.9
7	1,780	158	1,938	9.6
8	166	-	166	0.8
9	-	-	-	-
Province	17,713	2,448	20,161	100.0

Source: R. J. Miller, Alberta's Hunting & Fishing Resources: An Economic Evaluation (Alberta Department of Agriculture, Resource Economics Branch, 1971) Table 18, p. 46.

Table 9

THE DISTRIBUTION OF ELK HARVEST

Region	Estimated Harvest, 1969 Residents	Non-Residents	Total	Percent of Prov. Total
1	-	-	-	-
2	314	-	314	8.2
3	975	53	1,028	26.8
4	453	-	453	11.8
5	1,323	105	1,428	37.2
6	453	53	506	13.2
7	105	-	105	2.8
8	-	-	-	-
9	-	-	-	-
Province	3,623	211	3,834	100.0

Source: R. J. Miller, Alberta's Fish & Wildlife Resources: An Economic Evaluation (Alberta Department of Agriculture Resource Economics Branch, 1971), Table 19, p. 47.

Table 10

THE DISTRIBUTION OF WHITETAIL DEER HARVEST

Region	Estimated Harvest, 1969 Residents	Non-Residents	Total	Percent of Prov. Total
1	84	-	84	0.7
2	540	27	567	4.9
3	706	-	706	6.1
4	208	-	208	1.8
5	955	-	955	8.2
6	1,786	-	1,786	15.4
7	997	-	997	8.6
8	4,902	26	4,928	42.5
9	1,371	-	1,371	11.8
Province	11,549	53	11,602	100.0

Source: R. J. Miller, Alberta's Fish & Wildlife Resources: An Economic Evaluation (Alberta Department of Agriculture Resource Economics Branch, 1971), Table 20, p. 48.

Table 11

THE DISTRIBUTION OF MULE DEER HARVEST

Region	Estimated Harvest, 1969			Percent of
	Residents	Non-Residents	Total	Prov. Total
1	38	-	38	0.4
2	1,278	-	1,278	11.8
3	1,617	-	1,617	14.9
4	564	-	564	5.2
5	2,106	26	2,132	19.7
6	1,467	-	1,467	13.6
7	489	-	489	4.5
8	1,766	-	1,766	16.3
9	1,467	-	1,467	13.6
Province	10,792	26	10,818	100.0

Source: R. J. Miller, Alberta's Fish & Wildlife Resources: An Economic Evaluation (Alberta Department of Agriculture Resource Economics Branch, 1971), Table 21, p. 49.

Benefits and Costs

As outlined in Table 2 of this study, there are both direct and indirect benefits and costs which can accrue to the big game hunting experience, depending upon whether or not it is taken to pertain to the viewpoint of the individual hunter, the province, or society as a whole. The individual hunter will realize a net benefit equivalent to his extramarket benefits while society realizes a net benefit of the sum of extramarket benefits and licence fees less development, management and operation costs. On the other hand, the net benefits of the experience to the Province of Alberta exclude consideration of non-resident extramarket benefits but include indirect benefits and costs derived from non-resident expenditures in Alberta.[1]

The estimation of resident and non-resident expenditures (including licence fees) on Alberta big game hunting indicates that some 82,000 resident hunters spent $3.6 million (approximately $44 per hunter), while only 4,000 non-residents spent $1.9 million (approximately $445 per hunter) on this activity.[2] The expenditures were estimated from the expenditures reported in the survey questionnaire along with imputed travel costs based on a 5 cents per

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[1]Table 12 gives a breakdown of the estimation of the component benefits and costs of the various viewpoints. An exception is noted in regards to extramarket benefits which are subject to estimation utilizing the selected methods and will be considered in that context.

[2]Table C-10, Appendix C gives a more detailed listing of the resident expenditures.

Table 12

BENEFITS AND COST ESTIMATES*

Item	Resident ($)	Non-Resident ($)
Expenditures*	2,731,939	1,617,387
Licence Fees	866,184	288,234
Management, Etc., Costs	496,397	31,531
Multiplier Impact Expenditures**	-	1,924,414
Extra Sales Expenditures	-	403,458

* Excludes licence fees and food costs.

** See R. J. Miller, "An Economic Evaluation of Alberta's Sport Hunting and Fishing Resources" (unpublished M.Sc. thesis, University of Alberta, Edmonton, 1971) for an explanation of the impact multiplier framework for hunting expenditures.

mile rate (1969 prices).

Big game management, development, and operation costs consisted of the total yearly expenditures of the Alberta Department of Lands and Forests on the maintenance of hunting activity in Alberta (estimated at $931,851 in 1969), allocated on the basis of the proportion of big game hunter days to all hunter days in 1969. A further breakdown to resident and non-resident big game portions was imputed on a similar basis utilizing the estimated numbers of each hunter type. Thus, it was estimated that, in 1969, approximately $0.5 million were spent in support of resident big game hunting in Alberta while only $32,000 was spent on non-residents.[1]

Indirect benefit and cost estimates for the purpose of this study were derived using the multipliers developed by Wright[2] along with estimated expenditures made by non-resident hunters in Alberta for big game hunting (approximately $1.4 million, or about $385 per hunter).[3] The impact multiplier adopted for the estimation of indirect benefits was 1.17337, in that for every non-resident dollar spent in Alberta there would be an impact of 1.17337 times that amount on the Alberta economy. In other words, one dollar of non-

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[1]It was assumed that resident and non-resident hunters were considered as one entity.

[2]R. W. Wright, "The Alberta Economy--an Input-Output Analysis," University of Alberta, Calgary, 1964. (Mimeographed.)

[3]See Table C-11, Appendix C.

resident expenditure would benefit Alberta to the extent of one dollar and seventeen cents. An impact multiplier of 24.6 cents to the dollar was adopted from Wright for the estimation of indirect costs (extra expenditures incurred to support sales to non-residents).[1]

The direct and indirect benefit and cost estimates are essential to the estimation of net benefits accruing to Alberta big game hunting. All are essential to the analysis at hand but none more so than the extramarket benefit component, which lacks the subjectivity of the other, more readily available dollar values. Thus lies the emphasis in net benefit measurement utilizing the three selected methods.

Direct Method

The direct method as outlined in Chapter III proved to be the easiest of the three methods in relation to extracting extramarket benefit estimates as evaluation questions were specifically designed in the original survey for this purpose. The estimation technique involved the allocation of stated per day values on a regional basis, where the extramarket benefits accruing to each individual hunter were taken as the multiple of the per day value and the number of days he hunted big game in that region. Hunting trips to more than one region

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[1]Table D-11 in Appendix D gives a breakdown of these indirect benefits and costs on a provincial as well as a regional basis. There are estimations of the net indirect benefits incurred as well.

were allocated by days hunted in each region and associated with the same per day value stated.

Resident and non-resident extramarket benefit estimations were conducted identically for the direct method in the study. The resultant values, utilizing the technique outlined above, were $10.45 per day for resident big game hunters versus $16.08 per day for non-residents.[1] In other words, the direct method, as applied, indicated that residents enjoyed approximately $4.7 million in extramarket benefits and non-resident big game hunters about $0.5 million. Table 13 gives a regional breakdown of these benefit estimates.

The regional distribution of the extramarket benefit estimates indicate that regions 2 and 3 were associated with about $2.4 million of these benefits or approximately 47 percent of the total for the province. Regions 4 through 8 accounted for roughly another 47 percent.

Upon examining the effect of the direct method extramarket benefit estimates on the three evaluation viewpoints, it is noted that these viewpoints differ significantly only with the inclusion of non-residents. The social net benefits to resident hunters amounted to about $4.7 million and to non-residents these benefits were approximately $0.5 million, or the equivalent of the extramarket benefits they reported having enjoyed. The Province of Alberta, on the other hand,

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[1] Refer to Table C-12, Appendix C for a comparison of these rates with the other methods as well as a look at their associated per hunter values.

Table 13

EXTRAMARKET BENEFITS BY REGION, DIRECT METHOD

Region	Resident $	Non-Resident $	Total $
1	109,432	-	109,432
2	1,068,552	191,405	1,259,957
3	1,047,842	102,410	1,150,252
4	374,738	56,700	431,438
5	735,293	53,932	789,225
6	446,130	18,929	465,059
7	309,886	15,442	325,328
8	401,683	-	401,683
9	163,515	14,840	178,355
Province	4,657,071	453,658	5,110,729

was estimated to have realized approximately \$5.0 million from resident big game hunters and \$1.8 million from non-residents. Finally, the net benefits to society as a whole amounted to a \$5.0 million contribution from Alberta residents and \$0.7 million from non-residents. The major differences in the three viewpoints were the inclusion or exclusion of non-resident extramarket benefits and non-resident expenditures on Alberta big game hunting in 1969. Net benefits to resident hunters themselves differed from the other viewpoints because of the inclusion of expenditures and the exclusion of big game management costs.[1]

The net benefit of big game hunting in Alberta, using the direct method as outlined, was estimated to range between \$5.1 million and \$6.8 million or roughly between \$59 and \$79 per hunter, depending upon the viewpoint taken. A regional analysis of net social benefits could lead to per hunter estimates outside the arbitrary province-wide range for the various viewpoints.

Pearse Method

The Pearse method, unlike the direct method, requires the imputation of extramarket benefits for resident and non-resident big game hunters from their relative fixed costs. Marginal consumers are

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[1]Refer to Tables 18, 19 and 20 at the end of this Chapter, pp. 81-83.

selected from each defined income group (i.e., that hunter or those hunters with the highest fixed costs incurred in each group), and the difference between these consumers' fixed costs and those of the other hunters in their respective groups represent the extra-market values enjoyed. The marginal consumer can be either a resident or non-resident big game hunter. Table 14 gives a break-down of the selected income groups and identifies the highest fixed costs for these groupings on a regional and provincial basis.[1]

Approximately 70 percent of the identified marginal consumer fixed cost levels were associated with non-resident big game hunters. Moreover, the figures did not relate to any consistent pattern or relationship for the selected groupings on an income basis. These fixed costs were the summation of the round trip travel costs and big game hunting expenses incurred by these hunters, excluding expenses such as food and beverages which were regarded as being costs that would normally have been incurred without participation in the big game hunting activity. Food and beverages were excluded to avoid allocation of expenses between hunting and home uses on an arbitrary basis.

The extramarket benefit estimates were computed utilizing the Pearse method. Resident big game hunters were estimated to have

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[1]Note that the provincial figures here were not used in the extramarket benefit computations for the province. These were calculated on a regional basis and summed for a provincial total, thus yielding a more conservative estimate than would otherwise have resulted.

Table 14

HIGHEST FIXED COSTS BY INCOME GROUP, PEARSE METHOD

	Region									
Group	1	2	3	4	5	6	7	8	9	Province
					$					
$0-$4,999	63.50*	335.18	361.10	133.00*	207.67*	172.31*	104.75*	129.00*	52.23*	361.10
$5,000-$9,999	110.37*	569.80	501.70	329.08*	440.33*	576.10	378.40	185.50	126.50*	576.10
$10,000-$14,999	280.28	855.90	736.80	874.70	721.40	1,147.25	444.80	250.73*	550.63	1,147.25
$15,000-$19,999	56.27*	671.00	1,034.60	1,876.20	1,870.20	178.67	787.20	66.75*	348.50*	1,876.20
$20,000-$24,999	-	580.90	530.80	-	352.60	-	-	-	-	580.90
$25,000+	-	579.73	1,790.85	-	-	376.33	707.90	-	-	1,790.85

Note: Values marked with an asterisk signify the highest fixed costs associated with resident hunters.

obtained approximately $110 extramarket benefits per day, for a provincial total of $49 million. Non-resident hunters were estimated to have obtained nearly $48 worth of extramarket benefits per day, for a provincial total of approximately $1.3 million. Table 15 gives a regional breakdown of these benefits as estimated.

The regional breakdown of the extramarket benefits indicates that approximately 80 percent of these benefits were obtained in regions 2, 3, 5 and 6. These regions account for about 75 percent of the resident and 85 percent of the non-resident big game hunting in 1969. The extramarket benefits appear to coincide to some extent with the location of big game hunting activity.

In regards to social net benefits from the three evaluation viewpoints, the Pearse method resulted in estimates of roughly a multiple of ten times the Direct method estimates for resident net benefits. Non-resident net benefits were in the order of three times those from the Direct method for the hunters themselves, equivalent to those for the province, and double those for society in general. The net benefits to the hunters themselves were approximately $52.4 million, $48.9 million attributable to the resident hunters and the remainder to the non-resident hunters. The net benefits to the province amounted to about $51.0 million with $49.3 million of this from resident big game hunting. Society in general was estimated to have obtained $50.9 million, $49.3 million

Table 15

EXTRAMARKET BENEFITS BY REGION, PEARSE METHOD

Region	Resident ($)	Non-Resident ($)	Total ($)
1	175,161	-	175,161
2	10,775,402	972,844	11,748,246
3	10,451,786	266,130	10,717,916
4	4,838,760	49,219	4,887,979
5	9,272,508	5,011	9,277,519
6	7,863,747	13,525	7,877,272
7	2,337,590	42,078	2,379,668
8	1,896,362	398	1,896,760
9	1,273,620	-	1,273,620
Province	48,884,936	1,349,205	50,234,141

coming from resident big game hunting.[1]

The net benefit estimates from the Pearse method are considerably greater than those from the Direct method, primarily for resident hunters. The imputation of extramarket benefits from differentials in incurred fixed costs (according to the selected income groupings) varied considerably from those indicated by direct inquiry and led to higher social net benefit estimates relative to the Direct method.

Hotelling-Clawson Method

Unlike the Direct method, which estimates extramarket benefits on the basis of individual responses, and the Pearse method, which derives estimates by a differentiating participants' fixed costs by income group, the Hotelling-Clawson method obtains estimates of extramarket benefits by imputing a demand relationship between attendance reflected by the trips taken and average costs per trip scaled to defined distance zones from which the participants originate.

The Hotelling-Clawson method is based on the use of average cost per trip as the price variable and the number of trips taken as the quantity variable relative to the defined concentric distance zones. Thus imputations for extramarket benefits can be derived from

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[1]Refer to Tables 18, 19 and 20 in this Chapter for the Pearse method estimates, pp. 81-83.

defining in conventional economic terms that C = f (T) where C = average cost per trip and T = number of trips.[1] The estimates to be derived from the Hotelling-Clawson method in this thesis are based on the utilization of direct least squares on a regional basis. In other words, direct least squares estimates are derived for each region according to the observed quantity of trips undertaken from each defined distance zone[2] and the average cost per trip. The estimates are based on a non-linear relationship existing between the two variables; i.e., the regression equation takes the form of Log. C = a +b Log. T.[3]

The utilization of the non-linear direct least squares estimates for the determination of extramarket benefits involved taking the integral of the area under the curve between the origin

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[1]Previous studies have been conducted using regression of T = f (C) to derive a statistical demand curve for recreation. See E. Boyd Wennergren, "Recreational Resource Values: Some Emperical Estimates" in Water Resources and Economic Development of the West, Report No. 13 (San Francisco, California: Western Agricultural Research Council, 1964), pp. 13-28.

[2]See Tables D-13 through D-21 for the selected distance zones, on a regional basis.

[3]Table 16 contains the regression equations of this form derived from the observed number of trips taken and average cost incurred per trip, by region. R^2 values as well as significance levels are indicated for the two-tailed test.

Table 16

DIRECT LEAST SQUARES REGRESSION EQUATIONS

Region		Explained Variation
1	Log. C = 2.8041 - 0.5207* Log. T. (0.2302)	50.58%
2	Log. C = 2.2465 - 0.1996 Log. T. (0.2497)	6.63%
3	Log. C = 2.8964 - 0.3871* Log. T. (0.1810)	36.38%
4	Log. C = 4.1173 - 0.8297*** Log. T. (0.1241)	89.94%
5	Log. C = 2.7000 - 0.4056 Log. T. (0.2205)	29.71%
6	Log. C = 2.7080 - 0.3797 Log. T. (0.2123)	34.76%
7	Log. C = 2.9351 - 0.4538 Log. T. (0.3097)	34.93%
8	Log. C = 2.4886 - 0.3260** Log. T. (0.0891)	76.99%
9	Log. C = 2.9617 - 0.5028 Log. T. (0.2864)	50.68%

* Significant at the 10% level of significance.

** Significant at the 5% level of significance.

*** Significant at the 1% level of significance.

and the number of trips from the respective distance zones.[1]

Thus: $\log \text{area} = \log \left(\frac{\text{antilog. } a}{b+1}\right) + (b+1) \log . T, \; b < o$

This provided estimates of total benefits for each distance zone from which total costs were subtracted to give extramarket benefit estimates for the respective distance zones. The total costs were, in fact, the multiple of the number of trips taken and the average cost per trip estimate from the regression equation. Regional estimates were derived with their summation reflecting the provincial extramarket benefit estimates for the Hotelling-Clawson method.[2] Furthermore, the non-resident distance zones were identified and the extramarket benefit estimates attributable to non-resident Alberta big game hunters were separated from those for resident big game hunters. Table 17 contains a regional breakdown of the extramarket benefits on this basis.

The Hotelling-Clawson method, as applied in this study, resulted in an estimate of \$2.7 million for resident big game hunter

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[1]The form taken from calculating the integral was as follows:

$$\text{Antilog } a \left[\frac{T^{\,b+1}}{b+1}\right]_{0}^{T}, \text{ where } b < o$$

[2]Tables D-13 through D-21, Appendix D, contain the observed number of trips and average costs per trip on a regional and distance zone basis. Also, they contain the total benefit, total cost, and extramarket benefit estimates.

Table 17

REGIONAL EXTRAMARKET BENEFITS, HOTELLING-CLAWSON METHOD

Region	Resident ($)	Non-Resident ($)	Total ($)
1	61,592	6,720	68,312
2	250,279	29,572	279,851
3	515,359	42,694	558,053
4	949,503	347,806	1,297,309
5	233,922	9,336	243,258
6	228,404	10,092	238,496
7	181,949	18,406	200,355
8	148,774	2,748	151,522
9	141,115	6,667	147,782
Province	2,710,897	474,041	3,184,938

extramarket benefits and approximately $0.5 million for non-resident extramarket benefits. On a provincial basis, this is $16.80 per day for non-residents and $6.08 per day for resident big game hunters for 1969. Regions 2, 3 and 4 accounted for roughly 67 percent of these extramarket benefits.

The extramarket benefit estimates from the Hotelling-Clawson method were incorporated into the estimation of the social net benefits of Alberta big game hunting to the hunters themselves, to the province and to society in general.[1] This resulted in resident hunters enjoying approximately $2.7 million and non-residents $0.5 million worth of benefits. The Province of Alberta realized about $3.0 million from residents and $1.8 million from non-residents. The social net benefits to society amounted to $3.8 million--$3.0 million from residents and approximately $0.8 million from non-residents. Thus, the social net benefits of Alberta big game hunting in 1969 were in the range of $37 to $56 per hunter, depending on the viewpoint taken. This range of net benefits is greater than that for the Direct method (the lower limit is less, primarily due to the resident component) and is significantly different from that for the Pearse method.

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[1]Refer to Tables 18, 19 and 20 of this study.

Table 18

THE SOCIAL NET BENEFITS TO BIG GAME HUNTERS IN ALBERTA, 1969

	Direct Method		Pearse Method		Hotelling-Clawson Method	
	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident
	($)		($)		($)	
Direct Social Benefits						
Licence Sales	866,184	288,234	866,184	288,234	866,184	288,234
Extramarket Benefits	4,657,071	453,658	48,884,936	1,349,205	2,710,897	474,041
Expenditures	2,751,939	1,617,387	2,751,939	1,617,387	2,751,939	1,617,387
Total Social Benefits	8,275,194	2,359,279	52,503,059	3,254,826	6,329,020	2,379,662
Direct Social Costs						
Licence Sales	866,184	288,234	866,184	288,234	866,184	288,234
Expenditures	2,751,939	1,617,387	2,751,939	1,617,387	2,751,939	1,617,387
Total Social Costs	3,618,123	1,905,621	3,618,123	1,905,621	3,618,123	1,905,621
Total Social Net Benefit	4,657,071	453,658	48,884,936	1,349,205	2,710,897	474,041

Table 19

THE SOCIAL NET BENEFITS TO ALBERTANS FROM ALBERTA BIG GAME HUNTING, 1969

	Direct Method		Pearse Method		Hotelling-Clawson Method	
	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident
	($)		($)		($)	
Direct Social Benefits						
Licence Sales	866,184	288,234	866,184	288,234	866,184	288,234
Extramarket Benefits	4,657,071	N/a	48,884,936	N/a	2,710,897	N/a
Indirect Social Benefits						
Expenditures in Alberta (Non-Resident)	N/a	1,924,414	N/a	1,924,414	N/a	1,924,414
Total Social Benefits	5,523,255	2,212,648	49,751,120	2,212,648	3,577,081	2,212,648
Direct Social Costs						
Management, Etc., Costs	496,397	31,531	496,397	31,531	496,397	31,531
Indirect Social Costs						
Expenditures in Alberta (Non-Resident)	N/a	434,989	N/a	403,458	N/a	403,458
Total Social Costs	496,397	434,989	496,397	434,989	496,397	434,989
Total Social Net Benefits	5,026,858	1,777,659	49,254,723	1,777,659	3,080,684	1,777,659

N/a - Not applicable.

Table 20

THE SOCIAL NET BENEFITS TO SOCIETY FROM ALBERTA BIG GAME HUNTING, 1969

	Direct Method		Pearse Method		Hotelling-Clawson Method	
	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident
	($)		($)		($)	
Direct Social Benefits						
Licence Sales	866,184	288,234	866,184	288,234	866,184	288,234
Extramarket Benefits	4,657,071	453,658	48,884,936	1,349,205	2,710,897	474,041
Total Social Benefits	5,523,255	741,892	49,751,120	1,637,439	3,577,081	762,275
Direct Social Costs						
Management Costs	496,397	31,531	496,397	31,531	496,397	31,531
	496,397	31,531	496,397	31,531	496,397	31,531
Total Social Net Benefits	5,026,858	710,361	49,254,723	1,605,908	3,080,684	730,744

CHAPTER V

SUMMARY AND CONCLUSIONS

Alberta is a richly endowed province with a wide variety of natural resources, of which hunting is one. Hunting, particularly big game hunting, is a recreational activity supported by a composite of resources including natural foliage, scenic attributes, and wildlife. An important point to consider in the examination and evaluation of big game hunting activity is the highly aesthetic nature of hunters' involvement and non-involvement. Latent demand is a significant factor.

Resource managers, and particularly public decision-makers, should view an aesthetically oriented recreation activity in rational terms when considering alternatives for resource use. Alberta big game hunting is a case in point. Big game hunting in Alberta is virtually a provincewide phenomenon because of the large variety of game species available over the diverse topographical conditions found within Alberta's borders. This aesthetic resource-based recreation activity has been (and will be in future years) in conflict with the development of provincial oil, gas, coal, and timber industries which are encroaching on previously unscarred natural areas. Recent pressures from private enterprise in the province emphasize the need for close governmental scrutiny in regards to resource allocation and Alberta big game hunting, for this activity is publicly supported only through tradition in North America and is not bought and sold wholly in

a market.

The total big game hunting experience (including anticipation, travel to and from the activity site, the activity itself, and memories stemming from participation) is not readily converted into dollar terms to aid the provision of even a rough indication of the actual value of the activity. This is due to the difficulties inherent in placing dollar values or prices on items which are not sold wholly in a market. The term used in this study to indicate estimates of consumer surplus or the excess of benefit over cost to Alberta big game hunters, inclusive of licence fees, is extramarket benefits.

Big game hunting and its associated net benefits were examined in relation to the hunters themselves, the Province of Alberta, and society in general. Depending upon the selected method and the identity of the hunters under consideration (resident, non-resident, or both), the results varied from viewpoint to viewpoint. The direct method yielded estimates of total social net benefits of between $5.1 and $6.8 million in 1969 for big game hunting. The Pearse method yielded net social benefits in the order of approximately ten times those resulting from the direct method. The Hotelling-Clawson estimates were the lowest of the three, ranging from approximately $3.2 to $4.8 million. The viewpoints evoked estimates which ranged from a maximum social net benefit for the Province of Alberta, to a minimum estimate for the hunters themselves, with those to society being roughly midway between the two. Although the net benefit

estimates varied significantly between the selected methods, the ranking as to their magnitude remained identical. The results also indicated that it might be difficult to justify the reasonableness of the Pearse method estimates in light of the magnitude of those derived through the alternative methods, unless the Pearse estimates are conservatively biased.

The significant difference in net benefit magnitude for the Pearse method can be traced directly to the extramarket benefit component contributed by the method. A possible explanation for this would be the fact that the majority of highest fixed cost or marginal consumers for the selected income groups were non-resident big game hunters. In examining the sample, it was found that the majority of non-residents incurred much higher fixed costs from big game hunting activity in Alberta than did resident hunters from the same income group. This would tend to inflate surplus estimations for residents and deflate those for non-residents. Because of this, it may be preferable in future studies of this kind to analyze separately the benefits and costs stemming from resident and non-resident hunting activity, when using the Pearse framework. The grouping of resident and non-resident participants for evaluative purposes may distort estimates from what might otherwise be a realistic theoretical base.

Of the alterations in the original Pearse method, few were considered to have significantly affected the extramarket benefit estimates and their relative magnitude. The alterations were: the inclusion of non-residents, accounting of multiple trips, the

exclusion of the controversial time cost estimates, and the selection of income groups. Multiple trips and their related fixed costs were considered to be preferable for estimates regarding the whole big game hunting experience. Moreover, the occurrence of multiple trips was observed to be a negligible factor with non-resident big game hunters but one of some significance with residents. This would tend to result in more conservative surplus estimates than would have otherwise occurred.

Time costs were considered to be a relevant factor in the benefit-cost framework for big game hunting in Alberta. However, they were not included in the Pearse method here because of the crude methods of estimation which were available, as well as the fact that distortions in the benefit estimates may have resulted, thus the expected result from the inclusion of time cost would have been an increase in the highest fixed costs of the "marginal" consumers, given the attendance levels for each group. It seems likely that the inclusion of time cost estimates would have biased the increased fixed costs towards the non-residents who generally had higher incomes, travelled longer distances, and remained longer at the hunting sites than resident big game hunters.

The choice of the number and size of income groups could have significantly affected the extramarket benefit estimates. It is likely that more narrowly defined (thus more numerous) income groups would have led to lower extramarket benefit estimates. A further important consideration in regards to the income groups would be the

reliability of voluntarily submitted income estimates.

Overall, the Pearse method appears to be of some use in recreation benefit analyses for various hunting activities. It is thought that by adjusting the method for non-resident biases (perhaps by analyzing resident and non-resident demand separately), improving the delineation of income groupings, and improving upon the techniques of time cost estimation, the method might become an effective extra-market benefit evaluation approach, for hunting in particular.

The Hotelling-Clawson method, as applied to Alberta big game hunting, yielded extramarket benefit estimates totalling approximately \$3.2 million. As expected, this was less than the Pearse estimate of about \$50.0 million and the direct method estimates of approximately \$5.4 million.

Confidence in the reliability of the Hotelling-Clawson estimates was somewhat decreased due to the lack of statistical significance in the regression equations, as well as the lack of significant variation between average costs per trip for the resident big game hunters as the distances travelled increased. The latter item was possibly a major cause of the lack of significance although the relationship between non-resident average costs per trip and the observed number of trips also was different than expected.

As with the Pearse method, the estimates derived might have been more meaningful if approached with separate analyses of resident and non-resident hunter demand. The implication here is that resident demand for Alberta big game hunting is not similar enough to non-

resident demand characteristics to warrant joint evaluation techniques. The Hotelling-Clawson method, as used in this thesis, tends to support this with the observed average costs per trip. Resident hunters' average costs were relatively inelastic in regards to distance travelled, whereas the non-resident costs appeared to be more in accordance with expectations. It should also be noted that the number of trips originating from the various distance zones seemed to be much more closely correlated to the distance involved and not to the average cost per trip. The relationships may have been distorted to some extent by the inclusion of fixed licence fees in the average cost computations. Their effect would have a greater impact on non-resident average costs because of the relatively large magnitude of their licence fees and the fact that seldom did a non-resident big game hunter report more than one trip during the 1969 Alberta hunting season. It was felt that the Hotelling-Clawson method might be more effective in the evaluation of extramarket benefits for a recreational activity whose costs of participation are largely geared to travel costs (preferably those with minimal entrance fees, if any).

Extramarket benefit estimates using the direct method were the most easily derived for 1969 Alberta big game hunting. This was primarily due to the fact that the original questionnaire was designed with this method in mind. It was a relatively straightforward operation involving the addition of the response values and their expansion from the sample estimates to big game hunter population estimates. In other words, the technical aspects of the required benefit estimations were the easiest to compute in the case of the direct method. This does not,

however, place the method in absolute advantage over alternative methods. The method is vulnerable to both response and nonresponse biases. There is little to expect in the way of such biases with the alternative methods, except perhaps with the income statements essential to the Pearse method. It is thought that in terms of ease of application and flexibility, the direct method has superiority, but that this could not be said for the validity of the results on the basis of the estimates produced.

A comprehensive study of the merits of the selected methods should involve a testing of the bases for the supporting assumptions. The assumptions of the selected methods are the critical factors which should justify the "superiority" of one method over another, not the magnitude of the estimates, which may be the case. This thesis has derived net benefit and extramarket benefit estimates using the Pearse, direct, and Hotelling-Clawson methods, but superiority of one over the other or vice versa cannot be verified from them. It is a matter of opinion as to which method has the best or most realistic theoretical basis. All three selected methods have faults, either in regards to the relevant assumptions, the technique itself, or the applicability of the methods to the recreation activity in question. It appears that the results of this study favor the direct method over the two alternatives in terms of the reliability of the estimates derived. The implication here is that the assumptions behind this method are less restrictive and more realistic than those of the selected indirect methods.

Perhaps the most controversial assumption associated with indirect estimation methods is that concerning the homogeneity of the participants in terms of their actions and reactions. Examination of the assumptions required for the Hotelling-Clawson method in this regard (in conjunction with the magnitude of the estimates produced) might lead to the conclusion that an assumed constancy of action and reaction based on defined distance groupings of participants has an inherent conservative bias. This would tend to support findings that the estimates are consistently lower in all cases for the Hotelling-Clawson method. On the other hand, the Pearse method has a definite tendency towards higher estimates on a comparative basis. The assumed homogeneity of the participants by income level or by income group seems to inevitably result in unusually high estimates. The results derived for 1969 Alberta big game hunting support this thesis by showing that the fixed costs of those hunters within any income group did not conform on a comparative basis to expectations from the homogeneity assumption for the selected income groups. These groups cannot be defined without making an arbitrary decision. The marginal propensity to consume cannot be assumed equal for all participants from a particular income grouping, given that willingness to pay does not infer ability to pay and vice versa. Logically, a very wealthy, but miserly, big game hunter could spend very little on a big game hunting trip and enjoy greater consumer surplus than a hunter in the same income category who spends a considerable amount on his trip. This and the reversed situation are cases in point of the fallibility

of the homogeneity assumptions, especially in consideration of the Pearse method.

The Direct method has a unique characteristic that is not evident in the Pearse and Hotelling-Clawson methods: this method avoids the interpersonal comparisons inherent in the homogeneity assumptions of the indirect methods. By asking a participant in a recreation activity (in this case, big game hunting) about his or her willingness to pay over and above actual costs incurred, the researcher removes the necessity of imputing this from observed behaviour. In reality, the indirect methods infer enjoyment or a lack of it from participation in a recreation activity, rather than taking the alternative approach of direct inquiry. In essence, indirect methods involve value judgements related to the assumption of homogeneity within defined groups, while direct methods avoid the interpersonal comparisons necessary for the other methods. This indicates the fundamental advantage of the Direct method over the Hotelling-Clawson and Pearse methods when applied to Alberta big game hunting evaluation on both provincial and regional bases.

The regional aspects of Alberta big game hunting and the extramarket and net benefits derived from the activity can have important policy implications when regional big game hunting intensities and habitat conditions are brought into consideration. The regional data that were generated in regards to Alberta big game hunting are historical (1969) in nature, but when combined with present knowledge of big game hunting activity and any associated

problem areas, useful policy implications can be identified. Habitat management and hunting intensity control implications are the most immediate considerations.

The data produced on a regional basis point toward regions 2 through 6 as being the major big game hunting areas in Alberta. The most significant volumes of hunting were found in regions 2 and 3, which accounted for about 50 percent of the total big game hunting activity estimated for 1969. However, these same regions accounted for only 30-40 percent of the extramarket benefits enjoyed in the province from the activity. These regions encompass the west central portion of Alberta and stretch north to include the Peace River District. Lacking game counts for the defined regions in 1969, a stronger case cannot be made for any restrictive measures in order to more evenly distribute big game hunting activity throughout Alberta. Differential pricing and quotas are two restrictive measures which might be of use to Alberta game managers.

The potentials of differential pricing and quotas in limiting excessive hunting pressure in various parts of Alberta might be conducive to the optimization of game management practices in the province. As well as controlling resident and non-resident participation rates, there would be potential controls of harvest rates as well. Differential pricing entails higher licence fees for hunters wanting to hunt in specific areas and perhaps (as already exists) an additional price differential between residents and non-residents hunting in these areas. Quotas, on the other hand, would

involve a restriction on numbers allowed to hunt in certain regions, with or without a set of licence fee (i.e., the licences could possibly be marketed and sold at the price the market could bear). The quotas can also discriminate between residents and non-residents, giving preference to one group in the quota. Although quotas and differential pricing are attractive alternatives to the present system, the administration, management, and operation costs might be prohibitive. However, closer examination of the reported game kills, secondary benefit and cost estimates, hunter ratings, length of stay, hunter numbers, and extramarket values on a regional basis might give sufficient evidence to support such action.

Alberta big game hunting policy implications were examined in light of the extramarket and net benefit estimates generated in this thesis and the applicability of the three selected methods to this task. Individual estimates were produced for the Direct, Pearse, and Hotelling-Clawson methods. These, in turn, were examined from the point of view of the hunters themselves, the Province of Alberta and society in general. The conclusions drawn were that the Direct method had a definite advantage over the alternative selected methods when applied to Alberta big game hunting, and that the regional distribution of big game hunting activity is a critical factor in any plans to attempt to optimize the use of Alberta's big game resources.

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APPENDICES

APPENDIX A

SOME OTHER EVALUATION METHODS

Expenditures Method

The expenditures method has been widely used in attempts to measure the value of recreation on an individual as well as a regional basis in terms of total amount spent. The implication is that the value of a day's recreation is at least equivalent to the actual expenditures attributable to that day of recreation and that "the amount spent for recreation is determined by free choice over other alternatives to spend or save the same sum of money."[1] Estimates based on these assumptions may be useful for expenditure estimates but do little to justify public expenditure as well as the recreation opportunity itself. Moreover, these estimates may be considered to be only minimum values in light of the highly aesthetic nature of recreation activities.

Cost Method

The cost method is essentially evaluation based on the cost of developing or generating a particular recreation activity. The value of the activity is assumed to equal these costs. Such a method entails the justification of any recreational investment project. This method is seldom used now for this reason as well as the fact that

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[1]W. R. D. Sewell and J. Rostron, Recreational Fishing Evaluation, Canadian Department of Fisheries and Forestry (Ottawa: Queen's Printer, February, 1970), p. 7.

ranking, loss estimates, and the value of possible additions are not brought into consideration.

Gross National Product Method

This method involves relating recreation resource contribution to GNP, assuming recreation will stimulate production or is a factor of production. It is based on a conclusion that a recreation day is equivalent in value to per capita GNP value multiplied by the number of days in the year. The basic fault with this method is that, in reality, recreation is a consumer good, not a factor of production.

Market Value Method

Evaluation of recreation by this method involves the taking of a comparable private market value per unit for a public recreation service and multiplying this by the actual or expected attendance figures. Estimates of value using this method are questionable in that private services are not fully comparable to public ones and, moreover, a single value would not be appropriate for the evaluation of services offered in a variety of locations and under various circumstances.

Capel and Pandey Method[1]

The method used by Capel and Pandey in their evaluation of

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[1]See R. E. Capel and R. K. Pandey, "Estimation of Benefits from Deer and Moose Hunting in Manitoba," Canadian Journal of Agricultural Economics, Vol. 20 (1972), pp. 7-16

Manitoba deer and moose hunting is essentially a variation of the basics of the Hotelling-Clawson method in relation to concentric zones and increasing costs with increasing travel distance. Capel and Pandey have sought to evaluate recreation, in this case big game hunting, through the utilization of the following relationship:

$$Vijt = f\ (Dij,\ Sjt-1)$$

where: Vijt = total number of visits in year t to area j made by hunters in the i^{th} town;

Dij = round trip distance from i^{th} town to j^{th} hunting area; and

Sjt-1 = quality of hunting experience in j^{th} area in the previous year, measured by total game animals killed in the area divided by total visits to the area, both variables relating to the previous year.[1]

They maintain that the demand is a function of distance travelled as well as a quality variable represented by a lagged success ratio. This method is at fault for various reasons, among which are: the debatable use of a lagged success ratio to measure quality, their use of selected "cut-off point distances", and their use of the "discriminating monopoly revenue method" for the benefit estimation in dollar terms (that fee which would maximize revenue for a discriminating monopolist given the demand function). A more in depth consideration of the

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[1] Ibid., p. 9.

usefulness of quality variables in recreation evaluation as well as the relevance of consumer surplus estimation in regards to recreation activity might serve to improve the basis of this method. Furthermore, this and other multivariate estimation methods[1] do hold considerable promise, if the identification and specification problems can be minimized.

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[1]For example, see William G. Brown, Aijmer Singh, and Emery N. Castle, An Economic Evaluation of the Oregon Salmon and Steelhead Sport Fishery, Technical Bulletin No. 78 (Corvallis: Oregon Agricultural Experiment Station, 1964), and E. Boyd Wennergren, Herbert H. Fullerton, and Jim C. Wrigley, Estimation of Quality and Location Values for Resident Deer Hunting in Utah, Bulletin No. 488 (Logan: Utah Agricultural Experiment Station, Utah State University, 1973).

APPENDIX B

TIME COSTS AND RECREATIONAL EVALUATION

Time Costs In Recreation Benefit Estimates

Recreational evaluation methods such as those referred to as indirect methods, especially those based on travel costs, have essentially achieved their main purpose--placing dollar values on the various recreation activities. This has enabled decision-makers and, in particular, public decision-makers to consider recreation activities more concretely as an alternative to other proposals for the allocation of scarce resources. However, although these methods have improved recreation evaluation, they have not come close to resolving the problems presented by the highly aesthetic nature of recreation activities. Consumer's surplus estimation is but a relatively crude indication of aesthetic enjoyment, if any. The emergence of time cost bias questions has turned attention towards a more comprehensive accounting of non-monetary costs and, in particular, towards the opportunity costs of time.

Some of the more recent literature on recreational evaluation has either mentioned the possible bias introduced by time cost exclusion[1] or has gone so far as to develop crude estimates of this non-monetary cost factor.[2] Cesario and Knetsch, moreover, have

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[1]For example, see Romm, op. cit. and Knetsch and Davis, op. cit.

[2]For example, see Pearse, op. cit. and L. Merewitz, "Recreational Benefits of Water Resource Development," Water Resources Research, Vol. 2 (1966), pp. 625-640.

contributed a paper which provides a valuable insight into some of the more important aspects of this problem. They base their discussion on a thesis that:

> The effect of distance is likely to be a function of the time involved in making the trip as well as of the monetary cost . . . it may be expected that for many if not most recreational trips the effect of time on visit rates is likely to be of equal or even greater importance than the actual monetary cost incurred.[1]

In other words, they argue that the derived demand curves of the travel cost methods are biased in such a way that benefits are likely to be underestimated. They may underestimate benefits in that the inclusion of time cost estimates would shift the demand curve(s) upward over the range of quantities or use under consideration. Figure B-1 presents an effective illustration of this bias and the effects of a range of increasing time values on the location and shape of a particular recreational demand curve.

The question of the inclusion or exclusion of time cost estimates comes down to the trade-offs between money and time costs of the recreationists under consideration and the reliability of any time cost estimates that could be derived. Romm, for instance, was reluctant to use time cost estimates "because of the arbitrary character of any estimate of unit-time value."[2] Others, such as

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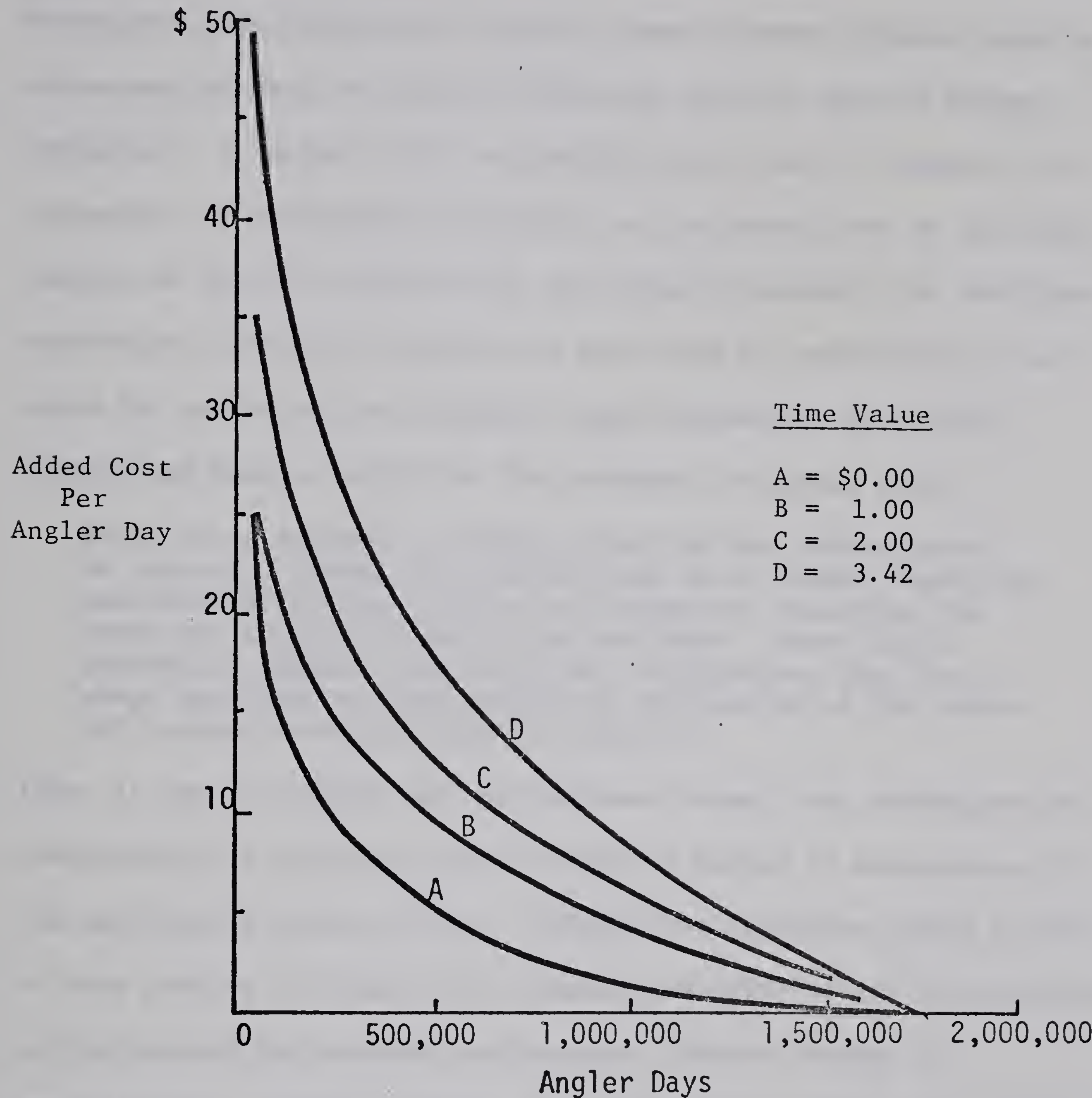
[1]Frank J. Cesario and Jack L. Knetsch, "Time Bias in Recreation Benefit Estimates," Water Resources Research, Vol. 6 (1970), p. 702.

[2]Romm, op. cit., p. 17

Figure B-1

AGGREGATE DEMAND FOR MICHIGAN SALMON - STEELHEAD FISHING



Angler Days

Note: Aggregate demand for salmon-steelhead angling in Michigan, net of current participation costs, using four different values for time. The entire area under each curve is the corresponding estimate of consumer surplus.

Source: Daniel R. Talhelm and Paul V. Ellefson, "Economic Evaluations of Sport Fishing in Michigan: A Comparison of Methods and Their Application," paper presented at the Joint AAEA-CAES-WAEA Meetings, Edmonton, Alberta, August, 1973, Page 13.

Pearse and also Talhelm and Ellefson, used a crude estimate based on an assumption that the value of time was equal to that of income foregone.[1] It appears that any estimate would seem to improve the estimation of recreational benefits, but estimates must be used with caution as little is known about the actual trade-offs for individual recreation activities between time and money for participants, let alone for individual participants among alternative activities. Cesario and Knetsch emphasize this weakness by saying that:

> There is no assurance, however, that the new demand curve is correct. Though the original bias is no longer there, the new formulation does require an assumption concerning the trade-off function between time and money. There is no guarantee, without some empirical verification, that the slope indicated by this particular formulation of the trade-off between time and money is correct.[2]

Thus, it can be pointed out that indirect travel cost techniques are questionable in their use, lack of use, or misuse of evaluations of the opportunity costs of time. Perhaps more attention should be paid to this problem in light of the complex aesthetic nature of recreation activities and the numerous motivational factors leading to participation. Rising incomes, increased leisure time, etc. have led to greater importance of recreation to people as a whole, and more

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[1] See Pearse, op. cit. and Talhelm and Ellefson, "Economic Evaluations of Sport Fishing in Michigan: A Comparison of Methods and Their Application" (paper presented at the Joint AAEA-CAES-WAEA Meetings, Edmonton, Alberta, August, 1973), p. 13.

[2] Cesario and Knetsch, op. cit., p. 704.

attention is called for in order to aid decision-makers in the allocation of resources among the various alternative uses, including recreation.

APPENDIX C

BIG GAME HUNTING DATA AND
SOCIOECONOMIC CHARACTERISTICS
OF BIG GAME HUNTERS FOR THE
PROVINCE OF ALBERTA

Table C-1

AGE STRUCTURE

	Resident Big Game Hunters	Non-Resident Big Game Hunters
Mean Age - Years	34.7	46.2
% to 19 years	10.4	--
% 20-29 years	26.5	11.1
% 30-39 years	29.6	19.1
% 40-49 years	19.2	29.6
% 50-59 years	10.0	28.4
% 60-69 years	3.4	9.3
% 70+ years	0.9	2.5

Table C-2

FORMAL EDUCATION LEVELS

	Resident Big Game Hunters	Non-Resident Big Game Hunters
Mean Education - Years	11.6	12.9
% 1- 8 years	13.0	8.2
% 9-12 years	53.1	46.6
% 13-16 years	26.8	35.8
% 17+ years	7.1	9.4

Table C-3

ANNUAL INCOME LEVELS

	Resident Big Game Hunters	Non-Resident Big Game Hunters
Mean Annual Income	$8,804	$13,894
% to $4,999	13.2	5.4
% $5,000-$9,999	54.6	29.1
% $10,000-$14,999	23.1	33.8
% $15,000-$19,999	4.8	14.2
% $20,000-$24,999	2.4	7.4
% $25,000+	1.9	10.1

Table C-4

WHERE BIG GAME HUNTERS SPENT THEIR YOUTH

	Resident Big Game Hunters %	Non-Resident Big Game Hunters %
Large City (≧ 50,000 pop.)	15.0	15.5
Small City (5,000-50,000)	5.5	17.4
Town (500-5,000)	16.8	18.0
Village (≦ 500)	8.7	6.8
Rural District	48.4	36.0
Combination of Above	5.6	6.3

Table C-5

OCCUPATIONS OF BIG GAME HUNTERS

	Resident Big Game Hunters %	Non-Resident Big Game Hunters %
Managerial	4.1	6.9
Professional & Technical	10.6	13.0
Clerical	3.8	1.3
Sales	7.4	6.9
Service & Recreation	7.9	7.5
Transport & Communication	8.5	8.8
Extractive Industry	24.6	11.3
Craftsmen & Production Workers	14.1	21.3
Laborers	5.2	8.0
Miscellaneous	13.8	15.0

Table C-6

KINDS OF LICENCES HELD

	Resident Big Game Hunters	Non-Resident Big Game Hunters
% Single Big Game	23.2	96.3
% Multiple Big Game	76.8	3.7
% Big Game and Bird Game	56.6	8.0
% Big Game and Angling	47.4	3.7

Table C-7

EVALUATIONS OF BIG GAME HUNTING

	Resident Big Game Hunters %	Non-Resident Big Game Hunters %
Excellent	6.5	17.1
Very Good	14.3	25.7
Good	30.2	25.7
Fair	26.4	16.4
Poor	22.6	15.1

Table C-8

TRIP PURPOSE

	Non-Resident Big Game Hunters %
Hunting	88.3
Vacation	6.8
Business	0.6
Visiting	4.3

Table C-9

NON-RESIDENT BIG GAME HUNTER
EXPERIENCE IN ALBERTA

	% Indicating
First Year Hunted in Alberta	54.3
Intend to Hunt Again in Alberta	85.2

Table C-10

RESIDENT BIG GAME
EXPENDITURES 1969*

Type	Average Per Hunter ($)	Average Per Day Hunted ($)
Licences	10.56	1.96
Travel**	10.57	1.96
Rentals	7.46	1.38
Lodging	3.77	0.70
Ammunition	7.58	1.40
Hunting Services, Misc.	4.17	0.77
Total	44.11	8.17

* Food and beverage costs were not included as they were considered to be a direct transfer of normal food costs.

** An operating or cash cost of $0.05 per mile was assessed on the distance travelled.

Table C-11

NON-RESIDENT BIG GAME HUNTER

EXPENDITURES IN ALBERTA 1969

Type	Average Per Hunter ($)	Average Per Day Hunted ($)
Big Game Licences*	67.25	10.19
Travel**	58.72	8.90
Lodging	21.90	3.32
Food and Beverages	43.91	6.65
Guiding	125.53	19.02
Other Hunting Services and Miscellaneous	67.79	10.27
Total	385.10	58.35

* The licence fee values were estimated by taking into consideration the residence of the hunters and the type of licence reported in order to apply the fee schedule as given in Table C-14.

** Travel costs were estimated on the basis of $0.05 per mile travelled to and from the area.

Table C-12

ESTIMATED EXTRAMARKET BENEFITS
BY THREE METHODS, 1969

Method	Average Per Day ($) Resident Big Game Hunters	Average Per Day ($) Non-Resident Big Game Hunters	Average Per Hunter ($) Resident Big Game Hunters	Average Per Hunter ($) Non-Resident Big Game Hunters
Direct	10.45	16.08	56.78	105.85
Pearse	109.71	47.81	595.98	314.79
Hotelling-Clawson	6.08	16.80	32.83	110.88

Table C-13

BIG GAME HUNTER
TRIP ANALYSIS

Category	Resident %	Non-Resident %
Big Game and Bird Game	4.5	6.0
Big Game Only	95.5	94.0
Total	100.0	100.0

Table C-14

BIG GAME LICENCE FEES[1] AND
BAG LIMITS, 1969

Licence	Fee	Bag Limit
Resident Moose	5.00	1 moose & 1 black or brown bear
Resident Moose Area 1	5.00	1 moose in Big Game Zone 1
Resident Elk	5.00	1 elk & 1 black or brown bear
Resident Whitetail Deer	3.00	1 whitetail deer
Resident Mule Deer	3.00	1 mule deer
Resident Sheep	7.50	1 trophy sheep
Resident Non-Trophy Sheep	5.00	1 non-trophy sheep
Resident Caribou	7.50	1 caribou
Resident Spring Bear	5.00	1 grizzly bear & 2 black or brown bear in the spring season
Resident Grizzly Bear	7.50	1 grizzly bear
Non-Resident Big Game	75.00	1 trophy sheep, 1 antlered animal & 1 black or brown bear
Non-Resident Alien Big Game	150.00	1 trophy sheep, 1 antlered animal & 1 black or brown bear
Non-Resident and Non Resident Alien Special Licence	50.00	1 moose in Zone 1
Non-Resident and Non-Resident Alien Spring Bear	25.00	1 grizzly bear & 2 black or brown bear
Non-Resident and Non Resident Alien Whitetail Deer	15.00	1 whitetail deer

[1]All hunters are required to purchase a Wildlife Certificate at a cost of $2.00.

APPENDIX D

BIG GAME HUNTING DATA BY REGION

Table D-1

THE DISTRIBUTION OF RESIDENT
BIG GAME HUNTING ACTIVITY, 1969

Region	Estimated No. Hunters*	Estimated No. Days	Avg. No. Days Per Hunter
1	1,938	9,690	5.0
2	19,961	86.862	4.4
3	20,057	107,361	5.4
4	7,994	37,574	4.7
5	14,342	67,913	4.7
6	14,003	46,855	3.4
7	6,977	29,012	4.2
8	13,566	43,347	3.2
9	5,959	16,983	2.8
Province	82,025	445,597	5.4

* The sum of the number of hunters by region does not equal the provincial total because one hunter may make multiple trips to various regions.

Table D-2

THE DISTRIBUTION OF NON-RESIDENT
BIG GAME HUNTING ACTIVITY, 1969

Region	Estimated No. Hunters	Estimated No. Days	Avg. No. Days Per Hunter
1	53	265	5.0
2	2,813	16,521	5.9
3	710	4,294	6.0
4	105	1,418	13.5
5	131	1,266	9.7
6	184	1,709	9.3
7	289	2,188	7.6
8	53	186	3.5
9	53	371	7.0
Province	4,286	28,218	6.6

Table D-3

DISTRIBUTION OF BIG GAME
HUNTING DAYS, 1969

Region	Estimated No. Days			Percent Of Provincial Total
	Residents	Non-Residents	Total	
1	9,690	265	9,955	2.1
2	86,862	16,521	103,383	21.8
3	107,361	4,294	111,655	23.6
4	37,574	1,418	38,992	8.2
5	67,913	1,266	69,179	14.6
6	46,855	1,709	48,564	10.2
7	29,012	2,188	31,200	6.6
8	43,347	186	43,533	9.2
9	16,983	371	17,354	3.7
Province	445,597	28,218	473,815	100.0

Table D-4

BIG GAME HUNTING AND TOTAL HUNTING
BY REGION, 1969

Region	Total No. Days*	No. Big Game Days	Percent Big Game
1	14,509	9,955	68.6
2	135,757	103,383	76.2
3	120,607	111,655	92.6
4	39,747	38,992	98.1
5	84,374	69,179	82.0
6	82,258	48,564	59.0
7	65,963	31,200	47.3
8	195,754	43,533	22.2
9	97,360	17,354	17.8
Province	836,329	473,815	56.7

*The total hunting days were taken from R. J. Miller,"Alberta's Hunting and Fishing Resources: An Economic Evaluation" (Edmonton: Alberta Department of Agriculture, Resource Economics Branch, 1971), Table 5, p. 29.

Table D-5

RESIDENT AND NON-RESIDENT BIG GAME LICENCE

DISTRIBUTION BY TYPE AND REGION

Region	Single (%)		Multiple (%)		With Bird Licence (%)		With Angling (%)	
	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident
1	30.0	100.0	70.0	-	65.0	-	50.0	-
2	25.2	97.2	74.8	2.8	53.4	8.4	45.9	1.9
3	15.7	96.3	84.3	3.7	50.2	3.7	48.3	7.4
4	6.7	100.0	93.3	-	49.1	-	50.9	-
5	10.8	100.0	89.2	-	48.0	20.0	55.1	20.0
6	14.9	71.4	85.1	28.6	56.7	-	48.4	-
7	22.2	100.0	77.8	-	60.4	9.1	48.6	9.1
8	26.4	50.0	73.6	50.0	65.0	50.0	48.9	-
9	15.4	100.0	84.6	-	65.0	-	48.0	-
Province	23.2	96.3	76.8	3.7	56.6	7.8	47.4	3.7

Table D-6

RESIDENT RATINGS OF
ALBERTA BIG GAME HUNTING
BY REGION, 1969*

Region	Rating (%)				
	Excellent	Very Good	Good	Fair	Poor
1	20.5	15.4	28.2	28.2	7.7
2	10.7	21.1	33.6	20.9	13.7
3	7.8	18.7	31.0	25.3	17.2
4	2.7	10.7	30.0	25.3	31.3
5	3.1	7.2	23.8	30.7	35.2
6	3.3	11.8	31.3	29.4	24.2
7	6.6	23.4	28.5	26.3	15.2
8	5.6	16.9	34.6	25.2	27.7
9	4.2	7.6	24.6	29.7	33.9
Province	6.5	14.3	30.2	26.4	22.6

* The ratings given for big game hunting were assumed applicable to all regions in which each hunter had hunted big game.

Table D-7

NON-RESIDENT RATINGS OF BIG GAME
HUNTING IN ALBERTA BY REGION, 1969

Region	Rating (%)				
	Excellent	Very Good	Good	Fair	Poor
1	-	-	100.0	-	-
2	17.8	30.7	27.7	13.9	9.9
3	16.7	20.8	29.2	12.5	20.8
4	25.0	-	-	25.0	50.0
5	20.0	20.0	20.0	20.0	20.0
6	-	14.3	-	42.9	42.8
7	20.0	30.0	10.0	20.0	20.0
8	-	-	50.0	50.0	-
9	-	-	-	-	100.0
Province	17.1	25.7	25.7	16.4	15.1

Table D-8

RESIDENT BIG GAME HUNTER INCOME DISTRIBUTION

BY REGION

	Income (%)					
Region	$0-4,999	$5,000-9,999	$10,000-14,999	$15,000-19,999	$20,000-24,999	$25,000+
1	8.8	55.9	26.5	8.8	-	-
2	15.7	58.5	21.4	3.0	1.1	0.3
3	10.8	55.7	26.1	4.8	1.3	1.3
4	11.3	50.0	24.6	6.4	3.5	4.2
5	9.5	53.0	21.7	7.1	3.6	5.1
6	12.6	57.6	20.6	3.8	3.3	2.1
7	10.4	59.3	24.4	3.0	2.2	0.7
8	18.2	48.9	23.5	3.6	4.0	1.8
9	4.0	53.6	23.2	9.1	7.1	3.0
Province	13.2	54.6	23.1	4.8	2.4	1.9

Table D-9

NON-RESIDENT BIG GAME HUNTER INCOME DISTRIBUTION

BY REGION

	Income (%)					
Region	$0-4,999	$5,000-9,999	$10,000-14,999	$15,000-19,999	$20,000-24,999	$25,000+
1	-	-	100.0	-	-	-
2	4.9	34.3	30.4	10.8	9.8	9.8
3	8.7	17.4	34.8	21.7	4.3	13.1
4	-	-	50.0	50.0	-	-
5	-	25.0	25.0	25.0	-	25.0
6	-	16.7	33.3	16.7	-	33.3
7	-	10.0	50.0	20.0	-	20.0
8	50.0	50.0	-	-	-	-
9	-	-	100.0	-	-	-
Province	5.4	29.1	33.8	14.2	7.4	10.1

Table D-10

ESTIMATED BIG GAME MANAGEMENT
COSTS BY REGION, 1969*

Region	Non-Resident Share ($)	Resident Share ($)	Total Costs	% Of Province
1	298	10,240	10,538	2.0
2	18,486	97,770	116,256	22.0
3	5,177	117,928	123,105	23.3
4	1,512	41,071	42,583	8.1
5	1,455	79,053	80,508	15.3
6	1,886	52,441	54,327	10.3
7	2,090	31,092	33,182	6.3
8	213	47,724	47,937	9.1
9	414	19,078	19,492	3.6
Province	31,531	496,397	527,928	100.0

* Management costs were allotted regionally according to the number of days spent in that region in proportion to total days spent hunting big game.

Table D-11

REGIONAL SECONDARY BENEFITS AND COSTS OF

ALBERTA BIG GAME HUNTING, 1969*

Region	Secondary Benefits ($)	Secondary Costs ($)	Net Secondary Benefits ($)	% Of Province
1	18,719	3,924	14,795	1.0
2	1,036,115	217,224	818,891	53.8
3	444,704	93,234	351,470	23.0
4	84,148	17,642	66,506	4.4
5	91,366	19,155	72,211	4.8
6	99,157	20,788	78,369	5.2
7	126,045	26,426	99,619	6.6
8	4,695	984	3,711	0.2
9	19,465	4,081	15,384	1.0
Province	1,924,414	403,458	1,520,956	100.0

* Secondary benefits were derived from estimated regional expenditures and secondary costs using the appropriate input-output multiplier.

Table D-12

BIG GAME HUNTER RESPONSE
TO EVALUATION QUESTIONS

Region	Resident (% Response)	Non-Resident (% Response)	All Big Game Hunters (% Response)
1	80.0	50.0	78.6
2	75.2	84.1	77.1
3	74.6	77.8	74.8
4	72.3	50.0	72.2
5	80.4	60.0	80.1
6	72.0	100.0	72.6
7	83.3	63.6	81.9
8	75.0	0.0	74.5
9	81.3	50.0	80.8
Province	75.9	77.9	76.1

Table D-13

HOTELLING-CLAWSON ESTIMATES--REGION 1

Distance (Miles)	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	1,735	24.34	13.10	47,430	22,729	24,701
100-199	723	20.96	20.67	31,190	14,944	16,246
200-299	265	24.23	34.85	19,280	9,235	10,045
300-399	96	24.50	59.14	11,850	5,677	6,173
400-499	-	-	-	-	-	-
500-599	48	26.15	84.86	8,500	4,073	4,427
600-699	-	-	-	-	-	-
700-799	-	-	-	-	-	-
800-1,299	27	280.28	114.50	6,452	3,092	3,360
1,300-1,799	-	-	-	-	-	-
1,800+	27	279.53	114.50	6,452	3,092	3,360

Table D-14

HOTELLING-CLAWSON ESTIMATES--REGION 2

Distance (Miles	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	16,698	20.00	25.33	528,400	422,960	105,440
100-199	11,421	17.82	27.33	389,900	312,136	77,764
200-299	3,470	18.67	34.66	150,300	120,270	30,030
300-399	2,144	23.38	38.16	102,200	81,815	20,385
400-499	434	22.09	52.49	28,460	22,781	5,679
500-599	554	13.63	49.99	34,600	27,694	6,906
600-699	145	23.54	65.33	11,840	9,473	2,367
700-799	96	29.47	70.82	8,507	6,799	1,708
800-1,299	2,157	295.95	38.12	102,700	82,225	20,475
1,300-1,799	289	400.95	56.93	20,550	16,453	4,097
1,800+	370	338.84	54.19	25,050	20,050	5,000

Table D-15

HOTELLING-CLAWSON ESTIMATES--REGION 3

Distance (Miles)	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	10,650	19.47	21.75	377,800	231,638	146,162
100-199	15,975	18.14	18.59	484,500	296,975	187,525
200-299	5,494	21.33	28.09	251,900	154,326	97,574
300-399	2,241	21.63	39.77	145,300	89,125	56,175
400-499	506	28.93	70.73	58,380	35,789	22,591
500-599	48	24.10	176.00	13,780	8,448	5,332
600-699	-	-	-	-	-	-
700-799	26	140.15	223.00	9,464	5,803	3,661
800-1,299	370	289.23	79.86	48,170	29,548	18,622
1,300-1,799	79	392.23	145.20	18,700	11,471	7,229
1,800+	210	799.20	99.42	34,060	20,878	13,182

Table D-16

HOTELLING-CLAWSON ESTIMATES--REGION 4

Distance (Miles)	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	4,337	16.77	12.57	320,200	54,516	265,684
100-199	4,482	19.70	12.24	322,100	54,860	267,240
200-299	2,675	16.86	18.78	294,900	50,237	244,663
300-399	337	28.29	104.70	207,200	35,284	171,916
400-499	-	-	-	-	-	-
500-599	-	-	-	-	-	-
600-699	-	-	-	-	-	-
700-799	-	-	-	-	-	-
800-1,299	53	437.80	486.00	151,200	25,758	125,442
1,300-1,799	26	874.70	877.60	134,000	22,818	111,182
1,800+	26	1,876.20	877.60	134,000	22,818	111,182

Table D-17

HOTELLING-CLAWSON ESTIMATES--REGION 5

Distance (Miles)	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	20,449	15.67	8.95	307,700	183,019	124,681
100-199	7,614	18.01	13.36	171,000	101,723	69,277
200-299	723	22.53	34.69	42,200	25,081	17,119
300-399	289	14.17	50.34	24,470	14,548	9,922
400-499	96	20.66	78.70	12,720	7,555	5,165
500-599	72	40.59	88.45	10,710	6,368	4,342
600-699	48	13.02	104.20	8,418	5,002	3,416
700-799	-	-	-	-	-	-
800-1,299	26	287.30	133.70	5,848	3,476	2,372
1,300-1,799	26	721.40	133.70	5,848	3,476	2,372
1,800+	79	1,133.77	85.17	11,320	6,728	4,592

Table D-18

HOTELLING-CLAWSON ESTIMATES--REGION 6

Distance (Miles)	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	15,373	17.02	13.13	325,400	201,847	123,553
100-199	5,445	18.88	19.47	170,900	106,014	64,886
200-299	1,157	20.59	35.05	65,400	40,553	24,847
300-399	193	22.87	69.21	21,540	13,358	8,182
400-499	48	45.21	117.40	9,103	5,635	3,468
500-599	-	-	-	-	-	-
600-699	-	-	-	-	-	-
700-799	48	38.83	117.40	9,103	5,635	3,468
800-1,299	-	-	-	-	-	-
1,300-1,799	131	442.75	80.19	16,930	10,505	6,425
1,800+	53	660.48	113.10	9,661	5,994	3,667

Table D-19

HOTELLING-CLAWSON ESTIMATES--REGION 7

Distance (Miles)	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	5,277	21.73	17.62	170,200	92,981	77,219
100-199	5,205	18.71	17.72	169,000	92,233	76,767
200-299	530	13.75	49.98	48,520	26,489	22,031
300-399	48	21.83	148.70	13,070	7,138	5,932
400-499	-	-	-	-	-	-
500-599	-	-	-	-	-	-
600-699	-	-	-	-	-	-
700-799	-	-	-	-	-	-
800-1,299	236	381.01	70.16	31,190	17,030	14,160
1,300-1,799	26	707.90	196.30	9,350	5,104	4,246
1,800+	-	-	-	-	-	-

Table D-20

HOTELLING-CLAWSON ESTIMATES--REGION 8

Distance (Miles)	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	15,469	21.02	13.26	304,500	205,119	99,381
100-199	2,915	21.33	22.87	98,860	66,666	32,194
200-299	843	19.06	34.26	42,850	28,881	13,969
300-399	96	44.32	69.56	9,908	6,678	3,230
400-499	-	-	-	-	-	-
500-599	-	-	-	-	-	-
600-699	-	-	-	-	-	-
700-799	27	185.50	105.20	4,214	2,840	1,374
800-1,299	27	114.10	105.20	4,214	2,840	1,374
1,300-1,799	-	-	-	-	-	-
1,800+	-	-	-	-	-	-

Table D-21

HOTELLING-CLAWSON ESTIMATES--REGION 9

Distance (Miles)	Total Visits	Avg. Cost Per Visit ($)	Estimated Avg. Cost Per Visit ($)	Total Benefits ($)	Total Cost ($)	Extramarket Surplus ($)
0-99	6,650	19.52	11.04	145,400	73,416	71,984
100-199	2,096	18.80	19.58	82,540	41,040	41,500
200-299	265	23.55	55.38	29,520	14,676	14,844
300-399	193	24.36	64.94	25,320	12,533	12,787
400-499	-	-	-	-	-	-
500-599	-	-	-	-	-	-
600-699	-	-	-	-	-	-
700-799	-	-	-	-	-	-
800-1,299	-	-	-	-	-	-
1,300-1,799	53	455.52	124.40	13,260	6,593	6,667
1,800+	-	-	-	-	-	-

APPENDIX E

THE SURVEY QUESTIONNAIRES

RESIDENT HUNTING INFORMATION - 1969 HUNTING SEASON

A. Travel Information

1. Where do you live? ______________________________
(Name of city or town)

2. What method of transportation did you use? (Specify)

From your home to the hunting area ______________________

In the hunting area ______________________________

B. Hunting Information

1. a) Which Alberta licenses did you hold last year? (Please check)

☐ Bird Game
☐ Sage grouse
☐ Mule deer
☐ Whitetail deer
☐ Camp Wainwright deer
☐ Goat
☐ Moose
☐ Moose (Zone 1)
☐ Elk
☐ Sheep
☐ Non-trophy sheet
☐ Caribou
☐ Grizzly bear
☐ Spring bear
☐ Angling license
Others (specify) ______________

b) Did you hold a Canada Migratory Game Bird Hunting Permit? Yes ____ No ____

2. Please complete the following for each hunting trip:

TRIP NO.	APPROX. DATE(S)	AREA(S) HUNTED: NEAREST TOWN OR LANDMARK	DAYS HUNTED IN AREA	MILES TO AREA	NO. IN HUNTING PARTY	GAME YOU HUNTED IN AREA	GAME BAGGED BY YOURSELF ONLY (TYPE & NUMBER)
example	Nov. 6 to 8	Vermilion	3	100	2	ducks & geese	10 ducks, 2 geese
1							
2							
3							
4							
5							
6							
7							
8							
9							

3. Based on your hunting experience, what is your overall rating of the hunting in Alberta last year? (chech ( ) where applicable.)

	Excellent	Very Good	Good	Fair	Poor
Upland Bird Game					
Migratory Bird Game					
Big Game					

4. How much did you personally spend in Alberta in 1969 for all hunting trips? (Please complete only as it applies to you.)

a) For Bird Game

		At Home	In-Route	At Hunting Site
i) Vehicle and equipment rental (do not include travel costs)	($)	________	________	________
ii) Guides	($)	________	________	________
iii) Lodging	($)	________	________	________
iv) Food, meals	($)	________	________	________
v) Beverages	($)	________	________	________
vi) Ammunition	($)	________	________	________
vii) Other not specified above	($)	________	________	________

Specify ____________

b) For Big Game

		At Home	In-Route	At Hunting Site
i) Vehicle and equipment rental (do not include travel costs)	($)	________	________	________
ii) Guides	($)	________	________	________
iii) Lodging	($)	________	________	________
iv) Food, meals	($)	________	________	________
v) Beverages	($)	________	________	________
vi) Ammunition	($)	________	________	________
vii) Other not specified above	($)	________	________	________

Specify ____________

C. General Information (This information will help to estimate the demand for hunting wildlife in Alberta).

1. What is your age? ________. 2. Occupation? ____________________.

3. Approximately how much is your gross family income (per year)? $ ________________.

4. How many years of formal education do you have? School ____________ years, Trade or Technical __________ years, University or College ____________ years.

5. How many years have you hunted? ____________

6. When do you generally hunt? (check)

	Bird Game	Big Game
On annual vacation	______	______
Special time off from work	______	______
Weekends or regular days off	______	______

7. Would you spend more time hunting if you had more free time? Yes ______ No ______

8. Did you spend most of your youth living in a large city (pop. over 50,000) __________, a small city (pop. 5,000 to 50,000) ________, a town (pop. 500 to 5,000) __________, a village (pop. 500 or less) __________, a rural district __________?

D. Evaluation (This information will help to determine the total value of wildlife resources to hunters.)

1. Approximately how much do you think a day's hunting is worth above what you spend on travel and other hunting expenses?

a) Please answer if you hunted big game in 1969.
$0___, $1___, $2___, $3___, $4___, $5___, $6___, $7___, $8___, $9___, $10___, Other $___.

b) Please answer if you hunted bird game in 1969.
$0___, $1___, $2___, $3___, $4___, $5___, $6___, $7___, $8___, $9___, $10___, Other $___.

2. Please outline any additional remarks that might help to evaluate hunting in Alberta.

____

____

NON-RESIDENT HUNTING INFORMATION - 1969 HUNTING SEASON

A. Travel Information

1. Residence ______________________ ______________________
(city or town) (state or province)

2. What method of transportation did you use? (Specify the type._

From your home to hunting area ______________________.

In the hunting area ______________________

B. Hunting Information

1. a) Which Alberta licenses did you hold last year? (please check)

Bird Game _____, Big Game _____, Special License _____, Whitetail Deer _____,

Spring Bear _____, Angling License _____.

b) Did you hold a Canada Migratory Game Bird Hunting Permit? Yes _____ No_____.

2. Please complete the following for each hunting trip:

Trips to Alberta 1969	Approx. Dates	Number in Hunting Party	Days Spent in Alberta	Area Hunted (nearest town or landmark)	Days Hunted in Area	Game you Hunted in Each Area	Game Bagged by Yourself Only (Type and Number)
1st Trip				1.			
				2.			
				3.			
				4.			
				5.			
2nd Trip				1.			
				2.			
				3.			
				4.			
				5.			
3rd Trip				1.			
				2.			
				3.			
				4.			
				5.			

3. How would you evaluate your game hunting in Alberta? (please check)

	Excellent	Very Good	Good	Fair	Poor
Upland Bird Game					
Migratory Bird Game					
Big Game					

4. Was 1969 the first year you hunted in Alberta? Yes _____ No _____

5. If "No", how many years have you hunted in Alberta? ___________.

6. Do you plan to hunt again in Alberta? Yes _____ No _____

If yes, more often _____, less often _____, same _____.

7. Was hunting the main purpose of your trip(s)? Yes _____ No _____

If No, what was the main purpose? ______________________

C. Expenditure Information

1. How much did you personally spend on your hunting trip(s) to Alberta? (please indicate total trip expenditure for all trips)

   a) travel (include planes, all cash vehicle expenses, vehicle rentals, etc.). $ ________
   b) lodging $ ________
   c) food, meals $ ________
   d) beverages $ ________
   e) fees (licenses) $ ________
   f) guides $ ________
   g) other hunting services $ ________
   h) miscellaneous (all other supplies purchased on trip, ammunition, etc.) $ ________

2. Approximately how much of the above was spent in Alberta?

   a) travel $ ________
   b) lodging $ ________
   c) food, meals $ ________
   d) beverages $ ________
   e) fees $ ________
   f) guides $ ________
   g) other hunting services $ ________
   h) miscellaneous $ ________

D. General Information (This information will help to estimate the demand for hunting wildlife in Alberta.)

1. What is your age? ____________ 2. Occupation? ____________________

3. Approximately how much is your gross family income (per year)? $____________

4. How many years of formal education do you have?

   School _____ years

   Trade or technical _____ years University or College _____ years

5. Did you spend most of your youth living in a large city (pop. over 50,000) _____, a small city (pop. 5,000 to 50,000) _____, a town (pop. 500 to 5,000) _____, a village (pop. 500 or less) _____, a rural district _____?

E. Evaluation (This information will help to determine the total value of wlidlife resources to hunters.)

1. Approximately how much do you think a day's hunting in Alberta is worth above what you spend on travel and other costs?

   a) Please answer if you hunted big game in 1969.
   $0___, $1___, $2___, $3___, $4___, $5___, $6___, $7___, $8___, $9___, $10___, Other $___.
   b) Please answer if you hunted bird game in 1969.
   $0___, $1___, $2___, $3___, $4___, $5___, $6___, $7___, $8___, $9___, $10___, Other $___.

2. Please outline any additional remarks that might help to evaluate hunting in Alberta.

____

____

____